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STATISTICAL STUDIES OF THE CHILDREN IN THE CHICAGO PUBLIC SCHOOLS FOR THE DEAF*

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At the request of Dr. Charles W. Richardson of the Committee on Survey of Schools for the Deaf, under the auspices of the National Research Council, I undertook to direct the work of examining the children in three public school institutions for the deaf in Chicago: the Parker Practice, the Alexander Graham Bell and the Jacob Beidler schools—290 children. As these examinations were to include physical examinations of the ear, nose and throat, as well as careful functional testing of the ears as regards both the hearing and the vestibular functions, the task was one requiring no small expenditure of time; and to be of any value, the work would have to be done by physicians properly trained to make careful examinations of the ear, nose and throat, and especially to carry out intelligently the various functional tests of the auditory function, as well as of the vestibular mechanism. Three assistants from the department of otolaryngology in Rush Medical College, Dr. Alice K. Hall, Dr. E. W. Hagens and Dr. J. W. Holderman, were selected for this work, all of whom were conversant with our methods for making the functional examinations, and accustomed to evaluate properly the results of these tests.

While making out the reports of the children examined for the survey which Dr. Richardson was directing, we decided to make some statistical studies which these examinations permitted. A number of problems present themselves which we are not including in our statistics. These may be presented in the report which Dr. Richardson will make later—such questions, for example, as the relationship between the nose and throat conditions found in these children and the existing ear trouble. Naturally, too, there comes up in one's mind first of all the question of prevention. We will make only a few general remarks on these problems.

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The first is that the type of ear trouble which we are considering is always in the nature of internal ear trouble or nerve deafness. Some of the cases, no doubt, developed secondary to middle ear infection, which in turn may have been brought on because of nose and throat conditions. It is, therefore, only in an indirect way and, of course, in relatively few of the cases, that correctable nose and throat conditions could be held responsible for the development of the ear trouble. The ear conditions which are directly dependent on correctable nose and throat alterations are in the nature of tubotympanic processes which, independent of an associated labyrinth involvement, can never produce deafness severe enough to handicap the child to any great extent. Such children are not found in the institutions for the deaf.

Of these 290 children, 123 have had their tonsils removed, and as far as we can gather, usually with the intention of improving the ear trouble. It is not at all unlikely that a few of these children had tonsil trouble which should have been corrected quite irrespective of any existing ear trouble, but the unpleasant fact stares us in the face that of these children, 123 had their tonsils removed for the purpose of improving an ear condition which could not be influenced in the slightest by any operations in the nose or throat.

Among the children examined, a few present nose and throat conditions which still require correction, but the indication for correction is not the existing ear trouble.

As regards the problem of prevention of deafness in the type of ear trouble which we are considering, it is not easy to see how any efforts at prevention could have made very much difference. For example, in the twenty-five cases of deafness caused by meningitis, nothing could be done, except the general treatment of meningitis, which could be expected to influence in any way the development of the internal ear involvement. Scarlet fever was responsible for only fourteen cases, and in eight only was the internal ear involvement secondary to or associated with an otitis media. Our experience with the fulminating type of otitis media which develops in scarlet fever, producing an involvement of the internal ear, is not such as to lead us to believe that any local treatment of the ear would have influenced very much the end-results. The same could be said of the other cases which are enumerated in this report.

We see the statement made often in textbooks and elsewhere that the prevention of the severe defects in hearing which develop so frequently in adult life is to be found in the timely attention, particularly in childhood, to the tubotympanic conditions common to that period of life, and which are so frequently dependent on tonsil and adenoid

trouble. This is a popular fallacy. The tubotympanic conditions in childhood rarely are prolonged into adult life; and it is rarely, if ever, that these processes are responsible for the development of those severe cases of deafness which come on in adult life and constitute a severe handicap to so many people.

Investigation shows that eighty-five of the cases of acquired deafness developed under 3 years of age, thirty between the ages of 3 and 5 and eleven between 5 and 10, and that in nineteen the age of onset was unknown. In other words, the younger the child the more vulnerable he appears to be for acquiring from various diseases a destruction of the hearing. In 115 of the children, the ear trouble developed before the age of 5, and in none did the trouble develop after the age of 10. It should be kept in mind in this connection that we were examining school children only, and that total loss of hearing develops in older people from each and every one of the causes which we have observed among these children; but the fact remains that the earlier years of childhood constitute the most precarious period as regards the destruction of the acoustic mechanism. This is due largely to the fact that those infectious fevers which are responsible for the destruction of the internal ear occur more frequently in childhood than in adult life. Later in life we have an entirely different menace to the hearing function. The deterioration of hearing due to the process of otosclerosis usually begins in early adult life, and in all cases sooner or later includes, in addition to the defect caused by fixation of the stapes, a defect in hearing due to degeneration of the nervous mechanism, which in the more severe cases leads eventually to total loss of function. In old age we have the degeneration of the eighth nerve, which we attribute to senile changes.

The influence of sex on the cases of acquired, as well as on those of congenital, deafness has been discussed in statistics compiled by others. Bezold found that in congenital deafness the female sex predominated and in acquired deafness the male predominated. Our statistics show the following: Of the patients with congenital deafness, seventy-three were males and seventy-two females; not much difference, but what there was showed a reversal of the findings of Bezold. Of the patients with acquired deafness, eighty-nine were males and fifty-six females, a finding in keeping with Bezold's statistics.

Statistics regarding the nationalities of these children are naturally influenced by the number of various nationalities in our population. Most interesting would be an examination of these statistics in comparison with the number of representatives of the various nationalities in the population of Chicago. The latter figures I do not have. We have compiled statistics concerning the nationalities of only 213 children: all the children of one school and part of those of the other two schools.

In making a statement (Table 1) of the number of children of the various nationalities, we are including only such children as were born in a foreign country or both of whose parents were born in a foreign country. All other children are classified as American, although by calling them American we must not overlook the fact that their parents may be of Russian, Italian or Polish descent.

The methods we used in making these examinations were as follows: The tests of hearing including testing for the voice, and testing the hearing at the lower end of the tone scale, using for this purpose the large, unclamped C fork (64 double vibrations) and the unclamped A Bezold fork (108 double vibrations). For the upper tone range we used the c^4 and the Edelmann-Galton whistle. The routine examination included also the application of the Weber, Schwabach and Rinné tests.

TABLE 1.—*Nationalities of Children Examined*

American (white)	71	Norwegian	3
Russian	32	Scotch	3
Italian	23	Greek	2
German	22	Slav	2
Polish	22	Bohemian	2
Swedish	7	Dutch	2
Irish	6	French	2
Austrian	6	English	1
Negro	6	Danish	1

Interesting studies remain yet to be made by carrying out audiometer tests for groups of these patients. This we hope to complete during the coming year.

The vestibular tests were carried out by the use of the rotating chair. When no responses were obtained with the patient in the upright position, the head was tipped forward and the tests were repeated. The use of the term normal responses in applying vestibular tests means normal responses so far as the after nystagmus is concerned. We use the term diminished vestibular responses when the nystagmus after turning was below 15 seconds. All above that were classified as normal responses.

It need hardly be pointed out in this connection that we are always dealing with bilateral defects. Testing monaural defects involves problems which did not present themselves in the type of cases which we were studying. Children who are attending a school for the deaf always have, as we have already pointed out, nerve trouble as the fundamental cause for their defects, and this nerve trouble, of course, involves both ears; otherwise the children would not be suffering from the handicap which necessitates their going to these institutions.

For the purpose of making this statistical study we divided the children into two groups, the first consisting of those suffering from congenital deafness and the second those in whom the defect had been acquired.

CONGENITAL DEAFNESS

In determining which children should be included in the group of congenital deafness (Table 2), we encountered some difficulty in ascertaining accurately whether the deafness was really congenital. For this reason we divided the group into those definitely congenital, and those in which we had some doubt, but in which the weight of evidence pointed toward the congenital origin of the defect. The latter we classified as probably congenital. In the definitely congenital group there were 119 and in the probably congenital twenty-six, making a total of 145, which we classed as cases of congenital deafness.

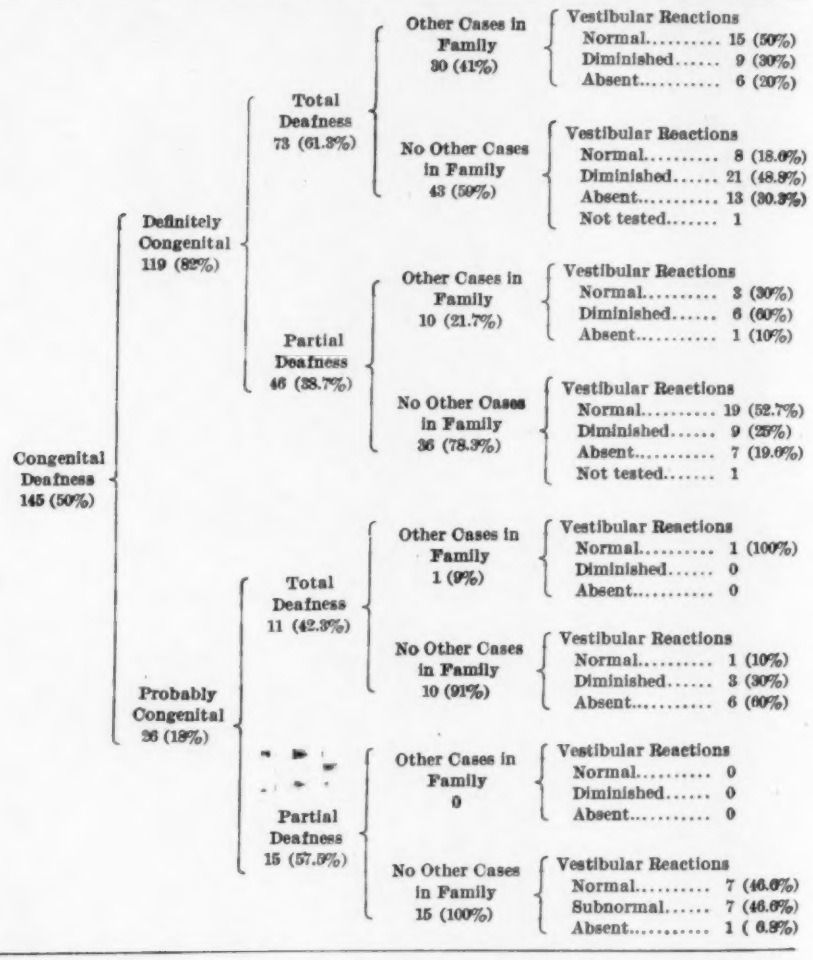
We next set out to determine how many in these two groups of definitely congenital and probably congenital were cases of total deafness and how many showed some remnants of hearing. Of the definitely congenital cases, in seventy-three we could not make out any remnants of hearing; in forty-six, remnants of hearing could be made out. In the probably congenital group there were eleven showing total deafness and fifteen with some remnants of hearing. It should be pointed out in this connection that care was taken not to confuse the tactile sensations with actual hearing; for example, in testing the tones lower than 64 double vibrations, patients often experience considerable difficulty in determining whether they hear or feel the tuning forks in testing air conduction, and when testing bone conduction the same difficulty is experienced often for the A tuning fork and at times for the c^1 tuning fork (256 double vibrations). In none of these children did we feel that there was any preservation of hearing for the lower part of the tone range. When remnants of hearing persisted, these were found higher in the tone range where no difficulty was experienced in determining definitely that the tests were actually heard.

In studying these children suffering from congenital deafness, we undertook to determine in how many instances there were other cases of deafness in the family. Among the 119 cases classed as definitely congenital, we found that there was a history of deafness in the families of forty, and that there was no such history in seventy-nine.

Dividing the group of definitely congenital into those with total deafness and those with partial deafness, we found that of the seventy-three cases of total deafness, there were other cases of deafness in the families of thirty, and no such history in forty-three cases. In the forty-six cases of partial deafness, ten patients gave no history of other cases of deafness in the family, and thirty-six had such a history.

On examining the twenty-six cases which we classed as probably congenital, we found a striking difference. Of the eleven patients suffering from total deafness, only one gave a history of deafness in the family, and of those suffering from partial deafness not a single case was recorded in which there was a family history of deafness. Alto-

TABLE 2.—*Cases of Congenital Deafness*



gether, in twenty-five out of twenty-six cases there was no history of deafness in the family.

The condition of the vestibular mechanism in the cases of congenital deafness has been one of considerable interest, and our next effort was to determine what the status of the vestibular reactions was in the several groups we have been studying. Beginning with the 119 cases of

definitely congenital deafness, seventy-three of which showed total deafness, thirty with other cases occurring in the family and forty-three with no history of other cases in the family, we found among the former —the thirty in which there were other cases of deafness in the family— normal vestibular reactions in fifteen, subnormal reactions in nine and an entire absence of reactions in six. Of the forty-three cases of total

TABLE 3.—*Cases of Acquired Deafness*

Acquired Deafness 145 (50%)	Associated at Onset with Otitis Media 56 (38.6%)	Definitely Acquired 35 (62.5%)	Total Deafness 6 (17.1%)	Vestibular Reactions	
				Normal	0
				Diminished	1 (16.6%)
				Absent	5 (83.4%)
			Partial Deafness 29 (82.9%)	Vestibular Reactions	
				Normal	16 (55.1%)
				Diminished	11 (38.2%)
				Absent	2 (6.7%)
		Probably Acquired 21 (37.5%)	Total Deafness 2 (9.5%)	Vestibular Reactions	
				Normal	10 (52.6%)
				Diminished	1 (50%)
				Absent	1 (50%)
			Partial Deafness 19 (90.5%)	Vestibular Reactions	
				Normal	10 (52.6%)
				Diminished	7 (36.8%)
				Absent	2 (10.6%)
	Not Associated at Onset with Otitis Media 89 (61.4%)	Definitely Acquired 67 (75.2%)	Total Deafness 33 (49.2%)	Vestibular Reactions	
				Normal	0 (0)
				Diminished	6 (18.1%)
				Absent	27 (81.9%)
			Partial Deafness 34 (50.8%)	Vestibular Reactions	
				Normal	13 (38.2%)
				Diminished	11 (32.4%)
				Absent	10 (29.4%)
		Probably Acquired 22 (24.8%)	Total Deafness 10 (45.5%)	Vestibular Reactions	
				Normal	1 (10%)
				Diminished	3 (30%)
				Absent	6 (60%)
			Partial Deafness 12 (54.6%)	Vestibular Reactions	
				Normal	2 (16.7%)
				Diminished	8 (66.6%)
				Absent	2 (16.7%)

deafness in which there was no history of other cases in the family, eight showed normal responses, twenty-one subnormal responses and thirteen a complete absence of vestibular responses. One patient was not tested. Altogether, in the seventy-three cases of total deafness, twenty-three showed normal responses, thirty subnormal, and nineteen an entire absence of responses; in other words, there were fifty-three cases

in which responses were obtained from stimulation of the vestibular mechanism, as opposed to nineteen in which these responses were absent.

Analyzing the forty-six cases of partial deafness, we find twenty-two with normal responses, fifteen with subnormal responses and eight with an absence of all response. One patient was not tested. In other words, taking the whole group of 119 definitely congenital cases, we find forty-five with normal responses and forty-five with subnormal responses, or ninety in which responses were obtained from stimulation of the vestibular mechanism, as opposed to twenty-seven cases in which the responses were absent. It is clear, therefore, that in congenital deafness we have a right to expect that in most cases the vestibular mechanism is still intact.

Analyzing in the same way the twenty-six cases which we classed as probably congenital: Of the eleven cases of total deafness, only two showed normal responses, three subnormal responses and six no responses. Of the fifteen in which there were some remnants of hearing, there were seven with normal responses, seven with subnormal responses and only one with a complete absence of all responses. In this group of twenty-six classed as probably congenital, then, we have altogether nine with normal responses and ten with subnormal responses, or nineteen cases in which responses were obtainable, as opposed to seven cases in which there were no responses.

Combining the twenty-six probably congenital with the 119 definitely congenital cases, we find that in a total of 145 cases, fifty-three gave normal responses and fifty-five subnormal responses, or a total of 108 in which responses were obtainable from stimulation of the vestibular mechanism, as opposed to thirty-four in which there was an absence of responses from such stimulation.

ACQUIRED DEAFNESS

The cases of acquired deafness totaled 145 (Table 3), and for reasons which have already been discussed under congenital deafness, it seemed desirable to make two classifications: those cases definitely acquired and those probably acquired. But before making this subdivision we made another broad subdivision of the cases of acquired deafness: first, those associated at onset with otitis media, of which there were fifty-six; second, those which were not associated at onset with otitis media, of which there were eighty-nine. An attempt is made here to put into one class all those cases in which otitis media and its sequelae, namely, some form of labyrinth involvement, were the cause of the trouble, and into another class those cases which developed independent of otitis media. The latter would include those cases which result, for example, from an extension to the labyrinth of a meningitis,

as well as those cases of primary labyrinth involvement; that is, a labyrinth involvement not following an otitis media. In some children, of course, an otitis media might be expected to develop subsequent to the onset of the deafness. These were carefully excluded.

Analyzing the first group, the fifty-six cases in which the deafness came on in connection with an otitis media, we do not want to leave the impression that the alterations in the middle ear coincident with the otitis media were responsible for the deafness. The deafness for which these children were placed in an institution for the deaf was always of labyrinthine origin. No defect in the sound conducting mechanism is capable of producing deafness severe enough to necessitate a child receiving special instruction in a school for the deaf. Of these fifty-six cases, we have classified thirty-five as definitely acquired and twenty-one as probably acquired; that is to say, in twenty-one cases the trouble came on so early in life as to leave some doubt in our minds as to whether these children might not have been born deaf and an otitis media had been wrongly blamed for the development of the defect.

Of the thirty-five definitely acquired cases, in only six was there total deafness, while in twenty-nine remnants of hearing could be detected. Of the twenty-one probably acquired, two were cases of total deafness and nineteen were cases of partial deafness. Altogether, of the fifty-six cases in which the deafness was associated at its onset with otitis media, eight showed total deafness and forty-eight showed some remnants of hearing. These results came as a surprise to us, for we had in mind as the cause for the deafness, associated at its onset with otitis media, the occurrence of what is termed panotitis (by panotitis we understand a destructive, suppurative process involving the labyrinth as well as the otitis media); and in these cases it would seem to be quite out of the question to expect to find remnants of hearing. It would seem, therefore, that a labyrinth involvement which we must assume was associated with the otitis media to produce deafness severe enough to necessitate special instruction in a school for the deaf was caused in these cases either by an associated toxic neuritis of the eighth nerve, such as one sees developing independent of an otitis media in infectious fevers, or by a milder form of labyrinthitis than the destructive, profuse, purulent disease—the mild form of labyrinthitis which we include in our textbooks under the heading of serous labyrinthitis.

The study of the vestibular reactions in these several groups was of great interest. Of the thirty-five definitely acquired cases associated with otitis media, none of the six cases of total deafness showed a normal response from vestibular stimulation. In one there was a subnormal response, and in five there was a complete absence of responses. Of the twenty-nine cases showing partial deafness, there were normal

responses in sixteen, subnormal responses in eleven, no responses in only two.

Of the twenty-one cases classed as probably acquired in this group of fifty-six associated at onset with otitis media, one of the two cases of total deafness gave a subnormal vestibular response and one gave an absence of response. Of the nineteen cases with remnants of hearing, ten gave normal responses, seven subnormal responses and two no responses.

In other words, in the entire group of fifty-six cases, there was vestibular response in only two of the eight showing total deafness, and this was a weakened, subnormal response. In all the others, in which there were remnants of hearing, forty-eight in number, vestibular responses were obtainable in forty-four and no vestibular responses in four. Forty-four cases of partial deafness in which we obtained definite vestibular responses are a substantial confirmation of the diagnosis of the cases in which we had concluded that there were remnants of hearing, for it is to be expected that in the cases in which the hearing had been wiped out completely by the labyrinth involvement associated with otitis media, the vestibular mechanism would also be obliterated. In endeavoring to determine whether there is any possible remnant of hearing in children, especially in this group in which the defect was associated at its onset with otitis media, it is recommended that the vestibular reactions be tested. If no response is obtainable, the probability is that there is also no remnant of hearing preserved. On the other hand, when the vestibular reactions are obtainable, even subnormal ones, our statistics show that there is probably some remnant of hearing which may be found useful in imparting instruction to the child.

In taking up the eighty-nine cases of acquired deafness which were not associated at onset with otitis media, we classified sixty-seven of these as definitely acquired and twenty-two as probably acquired. Of the sixty-seven definitely acquired cases, thirty-three showed total deafness and thirty-four partial deafness, while of the probably acquired, ten showed total deafness and twelve partial deafness. Thus there was no material difference between the two groups. Combining them we have forty-three cases of total deafness, as opposed to forty-six cases of partial deafness. It should be remembered in this connection that the eighty-nine cases include those in which there is a primary involvement of the labyrinth, probably usually a toxic neuritis, as well as those in which the internal ear involvement is secondary to meningitis.

Studying the vestibular reactions in this group of eighty-nine cases, we find that there was a normal response in only one of the forty-three cases in which there was total deafness; subnormal responses in nine, an entire absence of vestibular reactions in thirty-three. Of the forty-

six cases of partial deafness, fifteen gave normal vestibular responses, nineteen subnormal responses and twelve a complete absence of all vestibular response.

A practical conclusion that may be drawn from these figures is that, with few exceptions, the absence of vestibular responses in cases of acquired deafness, means the presence of total deafness; and conversely, the presence of vestibular responses, whether normal or subnormal, suggests the likelihood of there being some remnant of function in the

TABLE 4.—*Etiology of Acquired Deafness*

		With Otitis Media						Without Otitis Media					
		Total Deafness; Vestibular Response			Vestiges of Hearing; Vestibular Response			Total Deafness; Vestibular Response			Vestiges of Hearing; Vestibular Response		
Cause	Number	Normal	Diminished	Absent	Normal	Diminished	Absent	Normal	Diminished	Absent	Normal	Diminished	Absent
Meningitis	25	..	..	..	..	..	..	..	3	12	1	3	6
Scarlet fever	14	..	..	1	4	2	1	..	..	2	3	1	..
Mixed infections	11	..	..	..	2	3	2	..	..	3	..	..	1
Diphtheria	9	..	..	..	2	1	..	..	..	3	2	1	..
Pneumonia	9	1	..	..	..	1	..	..	2	3	..	1	1
Measles	8	..	..	..	2	4	..	..	1	..	..	1	..
Fever (?)	8	..	..	..	1	..	..	..	..	2	2	2	1
Suppurative otitis media	6	..	..	2	4	..	..	..	..	..	..	..	..
Suppurative otitis media with mastoiditis and operation	4	..	..	.	2	1	1	..	..	..	..	..	..
Typhoid fever	4	.	..	1	..	1	..	..	..	2	..	..	..
Influenza	3	..	..	..	1	1	..	..	..	..	1	..	..
Infantile paralysis	3	..	..	..	..	..	..	..	1	..	..	..	2
Skull fractures	3	..	..	..	..	..	..	..	..	3	..	..	..
Mumps	1	..	..	..	..	..	..	..	..	..	1	..	..
Probable otosclerosis	3	..	..	..	..	..	..	..	..	..	1	2	..
Whooping cough	2	..	..	..	..	1	..	..	..	..	..	..	1
Probable syphilis	12	..	..	..	..	..	..	..	..	..	..	..	..
Unknown	20	..	..	..	..	..	..	..	..	..	..	..	..
Total	145	1	..	4	18	15	4	..	7	30	11	11	12

cochlear mechanism; that is, some remnant of hearing. It is apparent from these figures that one is not justified in making any sweeping conclusions, as, for example, that in congenital deafness the vestibular reactions are always present, and that in acquired deafness, even when there is a total defect in hearing, there will be found an absence of vestibular reactions. A somewhat modified statement, however, is warranted, namely, that in congenital deafness, either total or partial, vestibular responses are more often present than absent; that in acquired total deafness, it is unusual to find any vestibular responses, and that in acquired partial deafness, vestibular responses are more often present than absent.

ETIOLOGY OF ACQUIRED DEAFNESS

We undertook to analyze according to etiology the 145 cases of acquired deafness (Table 4). The results are of considerable interest although the actual cause is not always quite definite; for although we made every effort to ascertain the exact facts, we found it not at all easy to make sure that the cause as stated was correct. We found it necessary, for example, to state as the cause for some of these cases the presence of fever, without being able to ascertain anything further. Wassermann reactions were carried out only in cases in which the absence of another likely cause and the manner of onset led us to suspect hereditary syphilis. A better plan would have been, of course, to have these tests carried out for all of the cases, but our facilities did not permit this.

Of the 145 cases of acquired deafness, there was a history of meningitis in twenty-five. In none of these, as we would expect, was there an associated otitis media. Fifteen of these cases showed total deafness and ten showed vestiges of hearing. Of the fifteen with total deafness, three showed diminished vestibular responses, and in twelve no responses whatever were obtainable. In ten children with vestiges of hearing, normal vestibular responses were present in one; diminished in three, and entirely absent in six. When meningitis involves the labyrinth of the ear it usually produces a destruction of the vestibular mechanism, even in patients in whom our examination seems to detect remnants of hearing.

Scarlet fever was responsible for fourteen cases. Eight of these occurred with otitis media. In only one did there appear to be total deafness and this child gave no vestibular reactions. Vestiges of hearing were found in seven and, as our previous studies would lead us to expect, vestibular responses were obtainable in six, four normal and two diminished, whereas in only one was there a complete absence of such responses. Six of the fourteen cases resulting from scarlet fever occurred without otitis media; two of them showed total deafness and no vestibular responses. Vestiges of hearing were found in four, in all of whom vestibular reactions were obtainable, three giving normal responses and one diminished.

Mixed infection in which scarlet fever or meningitis was present was given as the cause in eleven cases. In seven the condition occurred with otitis media. In all of these, vestiges of hearing persisted; in two the vestibular reactions were normal, in three diminished and in the other two entirely absent. Four occurred without otitis media. Three of these were cases of total deafness, and in all of them vestibular reactions were absent. In one, vestiges of hearing seemed to be present, but the vestibular reactions were gone.

Pneumonia was given as the cause in nine cases. In two of these there was otitis media: in one there was a total defect in hearing and normal vestibular responses and in the other there were vestiges of hearing with diminished vestibular responses. Of the seven cases of pneumonia without otitis media, five showed total deafness. In two there were diminished vestibular responses and in three a complete absence of these reactions. Vestiges of hearing were found in two. In one of these there was a diminished vestibular response, and in the other these responses were absent.

Diphtheria was given as the cause in nine cases, in three of which there was otitis media. All showed vestiges of hearing and gave vestibular responses. In two the responses were normal and in one diminished. Six of the cases of diphtheria developed without otitis media; three of these gave total deafness and a total absence of vestibular responses. In three there were vestiges of hearing, and all three gave vestibular reactions; in two, these were normal and in one diminished.

Measles was stated as the cause for eight cases, in six of which there was otitis media and in these there were vestiges of hearing and vestibular responses. In two the responses were normal; in four diminished In two of the eight, the defect in hearing developed without otitis media, one producing total deafness and the other with vestiges of hearing; in both diminished vestibular responses were obtainable.

In six cases suppurative otitis media was stated as the cause. In two of these the deafness was complete and there was an absence of vestibular responses. In four vestiges of hearing were present and the vestibular reactions normal.

Typhoid fever was stated as the cause for deafness in four cases. In two of these there was otitis media, one with total deafness and a complete absence of vestibular responses, and the other with vestiges of hearing and a diminished vestibular response. Two occurred without otitis media. In both there was total deafness and an absence of vestibular reactions.

Suppurative otitis media, complicated by mastoiditis with operation, was given as the cause for the deafness in four cases. In all four vestiges of hearing were present. In two there were normal vestibular responses, in one they were diminished and in one they were completely absent.

Influenza was responsible for three cases, two occurring with otitis media, having vestiges of hearing and giving vestibular reactions, one normal and the other diminished. One occurred without otitis media, and in this there were present vestiges of hearing and normal vestibular reactions.

Basal skull fractures caused three cases of deafness. These developed without otitis media; in all three there was total deafness and complete absence of vestibular responses.

Whooping cough was blamed for two cases, one occurring with otitis media. In this there were vestiges of hearing and diminished vestibular responses. The other occurred without otitis media with vestiges of hearing and an absence of vestibular reactions.

In three cases infantile paralysis was stated as the cause for the deafness. All of these occurred without otitis media. One showed total deafness and diminished vestibular responses, and two showed vestiges of hearing with an absence of vestibular reactions.

In only one case was mumps given as the cause. This occurred without otitis media; vestiges of hearing were present, and there were normal vestibular responses.

In eight cases fever of unknown origin was stated as the cause. One of these occurred with otitis media, and in this case there were vestiges of hearing and normal vestibular responses. Seven occurred without otitis media. In two there was total deafness and an absence of all vestibular reaction. In five there were vestiges of hearing; vestibular responses were normal in two, diminished in two and absent in one.

A strongly positive Wassermann reaction was found in twelve cases.

In three cases the cause of the deafness was attributed to otosclerosis. All occurred without otitis media and showed vestiges of hearing. The vestibular responses were normal in two and diminished in one.

In nineteen cases the cause was unknown. These were cases in which the histories were too vague to permit definite classification, or the examinations were incomplete.

HEREDITY AND CONSANGUINITY

Cases due to heredity and consanguinity call for a much more careful study than they have so far received. We classified under this heading 49 cases out of 145 congenital cases (Table 5), and have termed them developmental anomalies. Sometimes these cases involve the cochlea alone, producing complete or only partial loss in function; at times they involve the vestibular mechanism as well, likewise producing sometimes a complete absence of function, and at other times only a diminished function. What etiologic factors may underlie these hereditary cases should be the subject of further extensive investigation to determine whether syphilis may not be responsible for some of them, and to determine also whether the condition which is responsible for most of the cases of severe deafness in adult life, namely, the condition which we term otosclerosis, may not also be an important factor in the cases in which heredity and consanguinity are etiologic agents. It is

TABLE 5.—*Cases Due to Heredity and Consanguinity*

Cases (Grouped According to Family)	Nature of Consanguinity	History of Deafness in Family of Parents	Other Cases of Deafness in Immediate Family	Conclusion
1. H. family	Parents second cousins	On mother's side one aunt, one uncle and two cousins born deaf (mother is sister of Mrs. R., Family 2)	None	
(*a*) Gottlieb, aged 5 years; partial congenital deafness; vestibular mechanism normal				(*a*) Developmental anomaly; defect in cochlea
(*b*) Henry, aged 9 years; partial congenital deafness; vestibular mechanism slightly subnormal				(*b*) Same
2. R. family	Parents second cousins	On mother's side one aunt, one uncle and three cousins born deaf (mother is sister of Mrs. H., Family 1)	None	
(*a*) Emily, aged 10 years; partial congenital deafness; vestibular mechanism completely inactive				(*a*) Atypical developmental anomaly involving vestibular mechanism as well as cochlea
3. J. family	Parents first cousins	None	None	
(*a*) Peter, aged 15 years; total congenital deafness; vestibular mechanism normal				(*a*) Developmental anomaly involving only cochlear mechanism
(*b*) Joseph, aged 13 years; total congenital deafness; vestibular mechanism slightly active				(*b*) Same involving both vestibular and cochlear mechanisms
(*c*) Elsie, aged 12 years; total congenital deafness; vestibular reactions very much diminished				(*c*) Same involving both mechanisms, chiefly cochlear
(*d*) Frances, aged 9 years; total congenital deafness; vestibular mechanism slightly active				(*d*) Same as (*c*)
4. G. family	None	One cousin (Family 5) born deaf	None	
(*a*) Martha, aged 12 years; total congenital deafness; vestibular mechanism normal				(*a*) Developmental anomaly; defect in cochlea
5. S. family	None	One cousin (Family 4) born deaf	None	
(*a*) Elmer, aged 10 years; total congenital deafness; vestibular mechanism normal				(*a*) Developmental anomaly; defect in cochlea
6. K. family	None	Mother has one cousin born deaf	None	
(*a*) Frances, aged 16 years; total congenital deafness; vestibular mechanism normal				(*a*) Developmental anomaly; defect in cochlea
(*b*) Clarence, aged 13 years; total congenital deafness; vestibular mechanism normal				(*b*) Same as (*a*)

TABLE 5.—*Cases Due to Heredity and Consanguinity—(Continued)*

Cases (Grouped According to Family)	Nature of Consanguinity	History of Deafness in Family of Parents	Other Cases of Deafness in Immediate Family	Conclusion
7. B. family (*a*) Sally, aged 16 years; total congenital deafness; vestibular mechanism normal	None	None	One brother, aged 19 years	(*a*) Developmental anomaly; defect in cochlea
(*b*) Julia, aged 14 years; total congenital deafness; vestibular mechanism normal				(*b*) Same as (*a*)
8. L. family (*a*) Sylvan, aged 15 years; total congenital deafness; vestibular mechanism slightly subnormal	None	None	One sister	(*a*) Developmental anomaly; defect in cochlea
9. W. family (*a*) Agnes, aged 15 years; totally deaf; twin sister normal; no vestibular reactions	None	Definite history difficult to obtain	Twin sister normal	
10. Sm. family (*a*) Elsie, total congenital deafness; vestibular mechanism normal	None	None	None	(*a*) Developmental defect in cochlea
(*b*) Bertha; total congenital deafness; vestibular mechanism normal				(*b*) Same as (*a*)
11. We. family (*a*) Theodore, total congenital deafness; no vestibular responses	Parents first cousins	None	One older brother born deaf	(*a*) Developmental defect in cochlear and vestibular mechanisms
12. D. family (*a*) Laboria; total congenital deafness; no vestibular response	None	Deafness on father's side of family	None	(*a*) Developmental defect in cochlear and vestibular mechanisms
(*b*) Sam; total congenital deafness; no vestibular response				(*b*) Same as (*a*)
13. V. family (*a*) Marie; total congenital deafness; no vestibular response	None	None	(*a*) and (*b*) twins	(*a*) Developmental defect in cochlear and vestibular mechanisms
(*b*) Florence; total congenital deafness; no vestibular response				(*b*) Same as (*a*)
14. H. family (*a*) Frederick; total congenital deafness; vestibular responses weak	None	One uncle deaf	Two sisters deaf	(*a*) Developmental defect, cochlea mainly
15. A. family (*a*) Ruth; total congenital deafness; vestibular responses normal	None	One uncle deaf	(*a*) and (*b*) twins; one other sister deaf	(*a*) Developmental defect in cochlea
(*b*) Syriel; total congenital deafness; vestibular responses weak				(*b*) Same as (*a*); cochlea mainly

TABLE 5.—*Cases Due to Heredity and Consanguinity—(Continued)*

Cases (Grouped According to Family)	Nature of Consanguinity	History of Deafness in Family of Parents	Other Cases of Deafness in Immediate Family	Conclusion
16. F. family (*a*) Ruth; total congenital deafness vestibular responses normal	Parents second cousins	None	None	(*a*) Developmental anomaly, cochlea
(*b*) Irvin; total congenital deafness; vestibular responses normal				(*b*) Same as (*a*)
17. Go. family (*a*) Frances; total congenital deafness; no vestibular response	None	None	Brother deaf	(*a*) Developmental defect; cochlear and vestibular mechanisms
18. Ha. family (*a*) Philip; total congenital deafness; weak vestibular responses	None	None	Brother deaf	(*a*) Developmental defect; cochlea mainly
19. Az. family (*a*) Helen; slight vestige of hearing, right; weak vestibular responses; Wassermann reaction positive	Parents first cousins	None	Brother deaf; one cousin deaf	(*a*) Probably developmental defect; may be a case of hereditary syphilis
20. M. family (*a*) Mary, aged 14 years; vestige of hearing, right; diminished vestibular responses	None	None	Family of 7 children: 3 deaf, living; 2 deaf, deceased; 2 normal, living	(*a*) Developmental anomaly involving both cochlear and vestibular mechanisms
(*b*) Edith, aged 9 years; vestige of hearing, right; diminished vestibular responses				(*b*) Same as (*a*)
(*c*) Grace, aged 3 years; total congenital deafness; diminished vestibular responses				(*c*) Same as (*a*)
21. P. family (*a*) Raffaella, aged 14 years; total congenital deafness; normal vestibular responses (*b*) Tony, aged 7 years; total congenital deafness; diminished vestibular reactions (*c*) Lucy, aged 5 years; total congenital deafness; no vestibular responses	None	None	None	Developmental anomalies involving only cochlea in (*a*); cochlea and vestibule partially in (*b*); both involved in (*c*)
22. D'A. family (*a*) Sam, aged 8 years; total congenital deafness; prolonged vestibular responses (*b*) Leo, aged 9 years; vestiges of hearing, both ears (?); normal vestibular responses	None	None	None	Developmental anomaly involving cochlea only, both (*a*) and (*b*)

TABLE 5.—*Cases Due to Hereditary and Consanguinity—(Continued)*

Cases (Grouped According to Family)	Nature of Consanguinity	History of Deafness in Family of Parents	Other Cases of Deafness in Immediate Family	Conclusion
23. Mac. family (*a*) Ed, aged 12 years; vestiges of hearing, both ears; diminished vestibular responses (*b*) Jennie, aged 9 years; vestiges of hearing, both ears; diminished vestibular responses	None	None	None	Both (*a*) and (*b*); developmental anomaly resulting in only partial defect in cochlear and vestibular mechanisms
24. Mer. family (*a*) Angelina, aged 14 years; vestiges of hearing, both ears; normal vestibular responses (*b*) Pearl, aged 7 years; total congenital deafness; diminished vestibular responses	None	Cousins of Tony (Family 30)	None	Developmental anomaly involving only cochlear mechanism in (*a*) and chiefly cochlear in (*b*)
25. N. family (*a*) Ed, aged 16 years; vestiges of hearing, both ears; normal vestibular responses	None	None	One sister; one brother	(*a*) Developmental anomaly involving only cochlea
26. Ku. family (*a*) Dolly, aged 11 years; slight vestiges of hearing, both ears; diminished vestibular responses	None	None	One brother aged 3 years	(*a*) Developmental anomaly involving both cochlear and vestibular mechanisms
27. Kv. family (*a*) Anna, aged 12 years; total congenital deafness; no vestibular responses	None	None	Two brothers; one sister	(*a*) Developmental anomaly involving both cochlear and vestibular mechanisms
28. By. family (*a*) Vivian, aged 12 years; vestiges of hearing; weak vestibular responses (*b*) Parker, aged 8 years; total congenital deafness; no vestibular responses	None	Cousin	One brother aged 4 years	Developmental anomaly involving both cochlear and vestibular mechanisms, both (*a*) and (*b*)
29. E. family (*a*) Sarah, aged 11 years; vestiges of hearing, both ears; diminished vestibular responses	None	None	One brother	(*a*) Developmental anomaly involving both cochlear and vestibular mechanisms
30. Pal. family (*a*) Tony, aged 13 years; left school before record completed	.....	.....	.....	.....

SUMMARY OF HEREDITY AND CONSANGUINITY

Number of cases, 49.

Nature of Consanguinity: First cousins, 6; second cousins, five.

History of Deafness in Family of Either Parent: Uncles, 6; aunts, 3; others, 15.

Deafness in Immediate Family—Number of Other Members Deaf: One in family, 26; two in family, 9; three in family, 5; four in family, 3; twins, 5.

Vestibular Responses: Normal, 17; diminished, 19; absent, 11; incomplete, 1; indefinite, 1.

Deafness: Total, 34; partial, 13; indefinite, 1; incomplete, 1.

evident, therefore, that the term developmental anomalies is employed only because we have no more definite knowledge of the underlying pathologic condition than that the Wassermann tests were negative in all but one of these cases.

It would be interesting to be able to determine whether there may not be as large a number of persons who have developmental anomalies involving the vestibular mechanism alone with the hearing function normal. Naturally such persons are not brought together in groups as are the children who are segregated on account of defects in hearing. Considerable light was thrown on this subject, however, during the recruiting for aviation, when vestibular reactions were recorded as well as the hearing function. These examinations brought to light the fact that it is not uncommon to find persons with normal hearing and with very much diminished vestibular responses. Whether cases came to light in which there was a complete absence of vestibular response with normal hearing, I cannot say.

The important facts found in these cases of heredity and consanguinity may be summarized briefly as follows: In six cases the parents were first cousins; in five cases they were second cousins. There was a history of deafness in the family of the parents as follows: In six cases an uncle was deaf; in three cases an aunt was deaf, and in fifteen cases other relatives were affected. The situation in regard to deafness in the immediate families, brothers or sisters, brings out the following: In twenty-six cases a single other member of the immediate family was deaf; in nine cases two other members were deaf; in five cases three were deaf; in three cases four other members were deaf, and five cases were twins. The situation regarding the vestibular responses is summarized as follows: In seventeen of the children the vestibular responses were normal; in nineteen diminished, and in only eleven entirely absent; while in one case the responses were in doubt, and one case was incomplete.

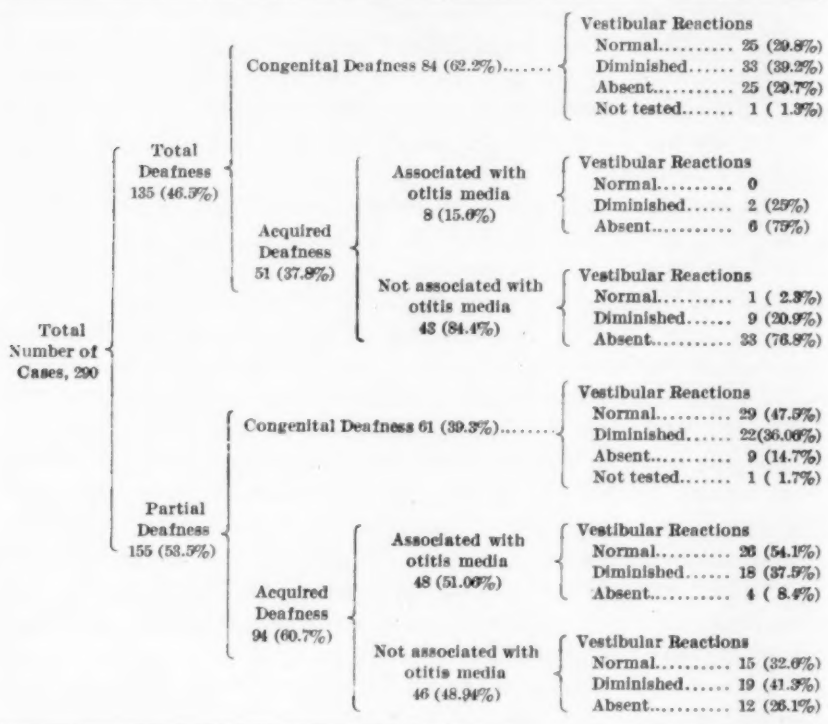
As regards the status of hearing: Thirty-four of the forty-nine were found to be totally deaf. In thirteen, remnants of hearing were detected, and in two the results were indefinite. A comparison of the results of the examination of the vestibular and cochlear mechanisms shows that the vestibular mechanism was preserved in thirty-six cases and was nonfunctioning in only eleven. In striking contrast to this, thirty-four of the cases showed total deafness, remnants of hearing detected in thirteen, while in two the status of the hearing was left in doubt. These results conform to the rule expressed earlier in this article; namely, that in hereditary deafness the trouble is more likely restricted to the cochlear apparatus, giving partial or complete defects in hearing, while in most instances the vestibular mechanism is left intact. While these relations constitute a general rule, exceptions are not infrequent.

STATUS OF HEARING

Statistics regarding the status of hearing are always of supreme interest because of the practical bearing which remnants of hearing may have in imparting instruction. We therefore undertook to analyze the relations which the status of hearing bear to the other factors that we have been considering (Table 6).

In the total of 290 cases, total deafness was found in 135, 46.5 per cent.; and remnants of hearing were found in 155, 53.5 per cent. Of the

TABLE 6.—*Status of Hearing*



children with total deafness, eighty-four, 62.2 per cent., were congenitally deaf, while in fifty-one, 37.8 per cent., the deafness was acquired.

Of these fifty-one cases of acquired deafness, only eight, 15.6 per cent., were associated at onset with otitis media, whereas forty-three, 84.4 per cent., were not associated with otitis media. This is rather significant because emphasis has usually been placed on the menace to the hearing that is associated with otitis media. To be sure, we are discussing here only cases of labyrinthine involvement, and many children have partial defects in hearing, as a result of otitis media, who are not handicapped sufficiently to necessitate their being placed in an institu-

tion for the deaf. It is significant, however, that 84.4 per cent. of the severe deafness developed without otitis media, and that only 15.6 per cent. of the cases were acquired defects associated with otitis media.

The relation of the vestibular responses in these cases of total deafness is also of great interest. Of the eighty-four cases of congenital deafness, vestibular reactions were found to be normal in twenty-five, 29.8 per cent., and diminished in thirty-three, 39.2 per cent. Vestibular reactions were found, therefore, in fifty-eight of this group of eighty-four children, that is, in 69 per cent. Reactions were absent in twenty-five, 29.7 per cent. One case was not tested.

Of the cases of acquired deafness, none of the eight associated with otitis media gave normal responses; two, 25 per cent., gave diminished vestibular responses, and six, 75 per cent., gave no vestibular responses. Of the forty-three children with acquired deafness not associated with otitis media, only one, 2.3 per cent., gave normal vestibular responses; nine, 20.9 per cent., gave diminished responses, and thirty-three, 76.8 per cent., gave no vestibular responses.

Summarizing the 155 cases of partial deafness, we found that in sixty-one, 39.3 per cent., such defects were congenital, and in ninety-four, 60.7 per cent., acquired. Of the sixty-one cases of congenital partial deafness, vestibular responses were normal in twenty-nine, 47.5 per cent.; diminished in twenty-two, 36.06 per cent., and absent in only nine, 14.7 per cent. One child was not tested.

Of the ninety-four cases of acquired partial deafness, twenty-six, 54.1 per cent., of the forty-eight associated with otitis media, gave normal responses; eighteen, 37.5 per cent., gave diminished responses, and only four, 8.4 per cent., gave no responses. Of the forty-six cases of partial acquired deafness not associated with otitis media, fifteen, 32.6 per cent., gave normal responses; nineteen, 41.3 per cent., diminished vestibular responses, and twelve, 26.1 per cent., no vestibular responses.

STATUS OF VESTIBULAR MECHANISM

The development of knowledge regarding the vestibular mechanism in more recent years has brought a new perspective to the study of deaf children. It is important, therefore, that our problem should be viewed from the standpoint of the vestibular reactions.

Of the total of 290 cases, vestibular responses were present, that is either normal or diminished, in 199, 68.3 per cent., and absent in eighty-nine, 38.2 per cent. Two cases were not tested.

Of the 199 children with vestibular responses, 109, 54.8 per cent., had congenital deafness and ninety, 45.2 per cent., acquired deafness. Of the 109 cases of congenital deafness, fifty-eight, 13.2 per cent.,

showed total deafness, and fifty-one, 46.8 per cent., showed remnants of hearing.

Of the ninety cases of acquired deafness showing vestibular responses, forty-six, 51.1 per cent., were associated with otitis media, and forty-four, 48.9 per cent., were not associated with otitis media. In the forty-six cases associated with otitis media, two children, 4.3 per cent., were found to be totally deaf, and forty-four, 95.7 per cent., had remnants of hearing. In the forty-four cases not associated with otitis media, ten children, 22.7 per cent., were totally deaf, and thirty-four, 77.3 per cent., had remnants of hearing.

TABLE 7.—*Status of Vestibular Mechanism*

Total Number Cases, 290	Vestibular Response Present, 199 (68.3%)	Congenital deafness 109 (54.8%)		Total deafness 58 (13.2%)
				Partial deafness 51 (46.8%)
		Acquired Deafness 90 (45.2%)	Associated with otitis media 46 (51.1%)	Total deafness 2 (4.3%)
				Partial deafness 44 (95.7%)
			Not associated with otitis media 44 (48.9%)	Total deafness 10 (22.7%)
				Partial deafness 34 (77.3%)
	(Two cases not tested)			
	Vestibular Response Absent, 89 (30.8%)	Congenital deafness 34 (38.09%)		Total deafness 25 (73.5%)
				Partial deafness 9 (26.5%)
		Acquired Deafness 55 (61.9%)	Associated with otitis media 10 (18.1%)	Total deafness 6 (60%)
				Partial deafness 4 (40%)
			Not associated with otitis media 45 (81.9%)	Total deafness 33 (73.3%)
				Partial deafness 12 (26.7%)

Of the eighty-nine cases in which vestibular responses were absent, the deafness was congenital in thirty-four, 38.09 per cent., and acquired in fifty-five, 61.9 per cent. Of the thirty-four cases of congenital deafness in which vestibular responses were absent, twenty-five children, 73.5 per cent., were totally deaf, and nine, 26.5 per cent., had remnants of hearing. Of the fifty-five cases of acquired deafness with no vestibular responses ten, 18.1 per cent., were associated with otitis media, and forty-five, 81.9 per cent., were not.

Of the ten associated with otitis media, six children, 60 per cent., were totally deaf and four, 40 per cent., showed remnants of hearing. Of the forty-five cases of acquired deafness in which vestibular responses

were absent, the deafness was total in thirty-three, 73.3 per cent., and partial in twelve, 26.7 per cent.

The fact that in the cases of acquired deafness in which the vestibular responses were absent, 81.9 per cent. were not associated with otitis media, as opposed to 18.1 per cent. in which otitis media was present, is of peculiar interest. What is the cause of the injury to the organ of hearing in acquired deafness not associated with otitis media? Most of these cases are the result of infection which does not seem to play an important part so far as the middle ear is concerned. Toxic neuritis would seem to be the outstanding cause even in the cases in which an otitis media has been found associated with the involvement of the labyrinth, which is responsible for the child's being placed in an institution for the deaf.

If we are correct in assuming that toxic neuritis is the cause of the defect in hearing in the cases of acquired deafness not associated with otitis media, the status of the vestibular mechanism both in cases of total as well as in those of partial deafness is of peculiar interest, as it throws light on the question of whether one can have a toxic neuritis of infectious origin involving the cochlea alone, leaving the vestibular mechanism intact. Our figures show that in 76.8 per cent. of the cases of total acquired deafness not associated with otitis media all vestibular responses were absent, and in only 2.3 per cent. were normal responses found, whereas in 20.9 per cent. they were still present but diminished.

These percentages are reversed in the cases of partial acquired deafness not associated with otitis media. Here we find vestibular responses absent in only 26.1 per cent., normal in 32.6 per cent. and diminished in 41.3 per cent.

The conclusion, therefore, is that it is possible for toxic neuritis of infectious origin to cause total destruction of the hearing function and still to leave the vestibular mechanism wholly or partially intact, although in most of these cases the vestibular mechanism is also destroyed.

In the cases of partial acquired deafness not associated with otitis media, the toxic neuritis, if this is the lesion that is causing the trouble, in most cases leaves the vestibular mechanism normal, or at least partially intact, and in relatively few cases is this mechanism entirely destroyed.

It is only fair to assume that the labyrinth involvement may be directly secondary to the otitis media when there exists a total defect in hearing such as would result from a diffuse suppuration. Of these there were only six out of fifty-five cases of acquired deafness with absent vestibular responses, and it is possible that in part or all of these the labyrinth involvement may have had nothing to do with the otitis media but developed exactly like the labyrinth involvement in those cases not associated with otitis media.

SUMMARY

1. Exactly one half of the children examined were found to be congenitally deaf, while the other half had acquired ear trouble.

2. Total deafness existed in 57.9 per cent. of the cases of congenital deafness and in 35.2 per cent. of the cases of acquired deafness.

3. Partial deafness was found in 42.1 per cent. of the cases of congenital deafness and in 64.8 per cent. of the cases of acquired deafness.

4. Vestibular responses were present in 75.1 per cent. of the cases of congenital deafness and in 62.07 per cent. of the cases of acquired deafness.

5. Vestibular responses were absent in 24.9 per cent. of the cases of congenital deafness and in 37.93 per cent. of the cases of acquired deafness.

6. A total absence of vestibular responses and total deafness were found in 17.5 per cent. of the cases of congenital deafness and in 26.2 per cent. of the cases of acquired deafness.

7. Presence of vestibular responses and total deafness were found in 40 per cent. of the cases of congenital deafness and in 8.2 per cent. of the cases of acquired deafness.

8. Absence of vestibular responses and partial deafness were found in 6.2 per cent. of the cases of congenital deafness and in 11.03 per cent. of the cases of acquired deafness.

9. Presence of vestibular responses and partial deafness were found in 34.5 per cent. of the cases of congenital deafness and in 53.8 per cent. of the cases of acquired deafness.

A study of the tables in which the analysis of our statistical studies is presented will throw light on a great many problems that we have not mentioned but leave for the individual to work out for himself.

It is our belief that an analytic study of the statistics which might be gained from a more extensive examination of the children in our institutions for the deaf would serve to throw light on many problems relating to deaf-mutism that are still obscure.

ESOPHAGEAL FINDINGS *

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In the correlation of subjective symptoms and clinical findings, including roentgenography, in conditions referable to the esophagus, endoscopic examination is of major importance. Visually, the lesion producing the symptoms may be studied and the nature of the condition determined. The roentgenographic findings with a proper interpretation should be available before and during endoscopic examination.

Dilations are not so striking by means of the esophagoscope as when seen roentgenographically with the esophagus filled with some radio-opaque fluid. Kinks and changes in normal direction are easily made out roentgenographically. The roentgenogram shows only the outline of the esophagus, either constricted within the lumen of the tube or with the lumen lessened by pressure from outside. Of course, in the great majority of cases, the nature of this constriction may be diagnosed entirely by the roentgenogram, but the visual examination by means of the tube adds materially to exactness in completing the diagnosis by determining the pathologic changes present. Practically all dilatations or sacculations of the esophagus are permanent.

Studies of dilated esophagi, made several years after the cessation of symptoms, have still shown dilatations and sacculations—of course, not so large, but generally the roentgenogram can easily be recognized when compared with the earlier one.

There are times when esophagoscopy would be contraindicated and the roentgenographic findings must be accepted. Such a case as this occurred a short time ago. The patient was an elderly woman who complained of increasing difficulty in swallowing, with some loss in weight. Roentgenograms showed some obstruction in the cervical esophagus. To confirm these findings, arrangements were made to examine her by means of the esophagoscope, but she had a hemiplegia the day before. This eventually cleared up entirely, and four months later another roentgenogram was taken. The degree of obstruction was sufficient to cause some of the barium mixture to overflow into the trachea. The patient was never examined by means of the esophagoscope, the diagnosis of the roentgenographer being accepted as correct. She has since undergone a gastrotomy, and is now fairly comfortable.

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* Read before the American Laryngological, Rhinological and Otological Society, Atlantic City, May 22, 1925.

However, another instance of entirely negative findings by roentgenographic examination that did not coincide with the clinical findings when an esophagoscopy was performed showed the lesion behind the larynx and in the lower part of the pyriform fossae. A similar case of a malignant growth in the same location with a report of a negative roentgenogram was referred for esophagoscopy because of the difficulty in swallowing and some overflow of the barium mixture into the larynx. These cases were confirmed as malignant by endoscopic examination, and their pathology was determined by biopsy.

Eventually, in order to determine positively the pathologic condition present, a visual examination is indicated in all but exceptional cases.

However, in all cases in which the esophagus is to be studied, a roentgenogram should be obtained before esophagoscopy. A more correct diagnosis is always obtainable when these two most important methods of investigation are employed conjointly.

In obtaining the endoscopic views of the esophagus, the following instruments were used: my modification of the Jackson and Lynah esophageal speculum, the Hasselinger directoscope, the Mosher ballooning esophagoscope and the Jackson full lumen esophagoscope.

Some of the illustrations are of normal anatomy and normal endoscopic views, and the remainder show abnormal conditions.

REPORT OF CASES

CASE 1.—A. F., a woman, aged 30, was semiconscious when first seen. She had accidentally swallowed a tablespoonful of tincture of iodin three weeks previously. She was suffering from food and water hunger, and it was necessary to have an emergency gastrostomy done.

One month after the gastrostomy, the patient had sufficiently recovered to permit esophagoscopy. The roentgenogram illustrated in outline was taken at this time and is self-explanatory. The ulcerated areas were cauterized with silver nitrate, 25 per cent., and within a week a No. 12, electrically heated bougie was passed through the esophagoscope, and after twenty minutes a dilation with a Mosher mechanical dilator up to 21 French was easily done. Dilation was done weekly, first using the heated bougies and then the mechanical dilator. In all, six dilations were sufficient to arrive at a 50 French, and dilation was performed three times afterward. The gastrostomy wound was allowed to close after the second dilation. The period of time consumed in the dilation was four months. The last treatment was done three and one-quarter years ago, and the latest reports from the patient are that she swallows normally.

CASE 2.—T. A., a youth, aged 16, had accidentally swallowed a tablespoonful of tincture of iodin three weeks previously. The patient was first seen on Nov. 14, 1924. He could swallow some semisolid foods but was living mostly on milk. The patient was in good physical condition, but was very apprehensive regarding the outcome of the accident.

Escophagoscopy disclosed a small ulceration about 1 cm. in diameter at 28 cm. (11 inches) from the upper teeth. This was cauterized with 25 per cent. of silver nitrate and the Yankauer resorcin bismuth mixture was given. This consists of resorcin, 1 part bismuth subcarbonate 5, glycerin 50, and water added to make 100 parts. Within a week the ulceration had healed, and

with heated bougies, using first a No. 12 and then a No. 28, a 9 mm. esophagoscope easily passed the stricture and the stomach mucosa was seen. Four subsequent dilations — getting up to a 45 Plummer — were done, so that the apples and beef steak test was suggested to him; it was tried so many times that his mother, a Scotchwoman, asked whether or not it was necessary to have these test meals applied so often. The patient was last examined five months ago, but a report a few days since stated that he was swallowing normally.

Fig. 1.—The right pyriform fossa, showing the arytenoid and aditus laryngis, seen through the Hasselinger directoscope. This method is essentially von Eichen's method of hypopharyngoscopy, except that direct vision is used.

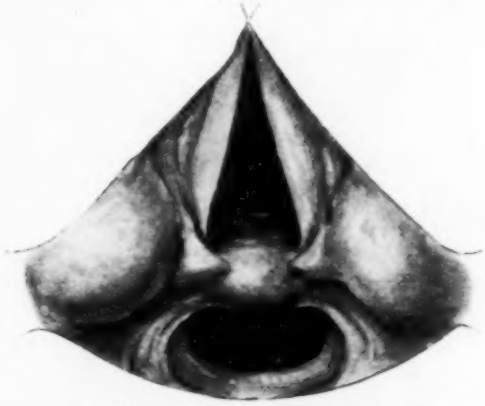

Fig. 2.—The larynx, trachea, pyriform fossae opened up, the cricopharyngeus, and the esophagus. This view is obtained through the Hasselinger directoscope, which is of considerable assistance in the examination of the posterior part of the larynx down to the cricopharyngeus.

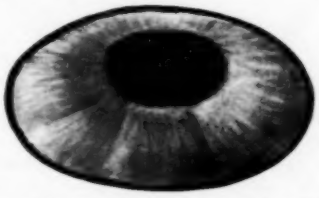

Fig. 3.—Cricopharyngeus seen through the Hasselinger directoscope. The muscle in the saggital plane is wedge-shaped, while in the horizontal plane (as shown in the illustration) it is falciform and rather shelf-like, as it stretches anteriorly from its attachments on the posterior wall and the median raphé.

In connection with the foregoing cases, it might be of interest for me to report briefly on three patients with lye strictures of the esophagus that are being treated at irregular intervals after forty-seven, forty-five and thirty-five years, respectively, following the swallowing

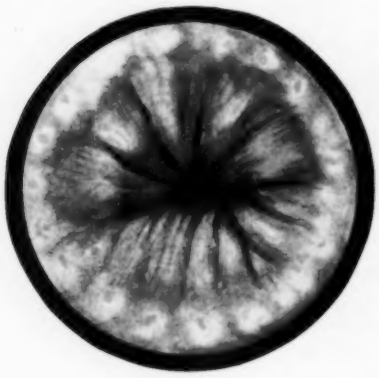

Figure 4.

Figure 5.

Fig. 4.—Thoracic esophagus in the region of the bronchial crossing, which is approximately from 25 to 27 cm. from the upper teeth in the adult. The mucosa in this region still retains the same characteristics of the mucous membrane of the upper esophagus and that of the mouth. It is rather a pale, pink.

Fig. 5.—Hiatus, approximately 33 to 36 cm. from the upper teeth. It is somewhat like a roset in appearance, and normally there appears an irregular change in the color of the mucosa, changing in spots from an even light pink to deeper shades.

Fig. 6.—Gastric mucosa, approximately 40 cm. from the upper teeth in the adult. The character of the mucous membrane has changed from a smooth glistening pink to an irregular, velvet-like red membrane.

of the lye. The first two patients have gone without treatment for two years at the longest, but then they need a few dilations that can be rapidly increased up to the larger sized bougies. They can then swallow any food for another indefinite period. The first patient has been

treated twice in five years, while the second patient has been under observation only one year; the third has been under observation for nine years, having been treated for two periods during that time. It appears as though these would be potential patients for dilation during the rest of their lives.

The importance of proper legislation regarding the labeling of lye containers with a poison label, and the general instruction of the public

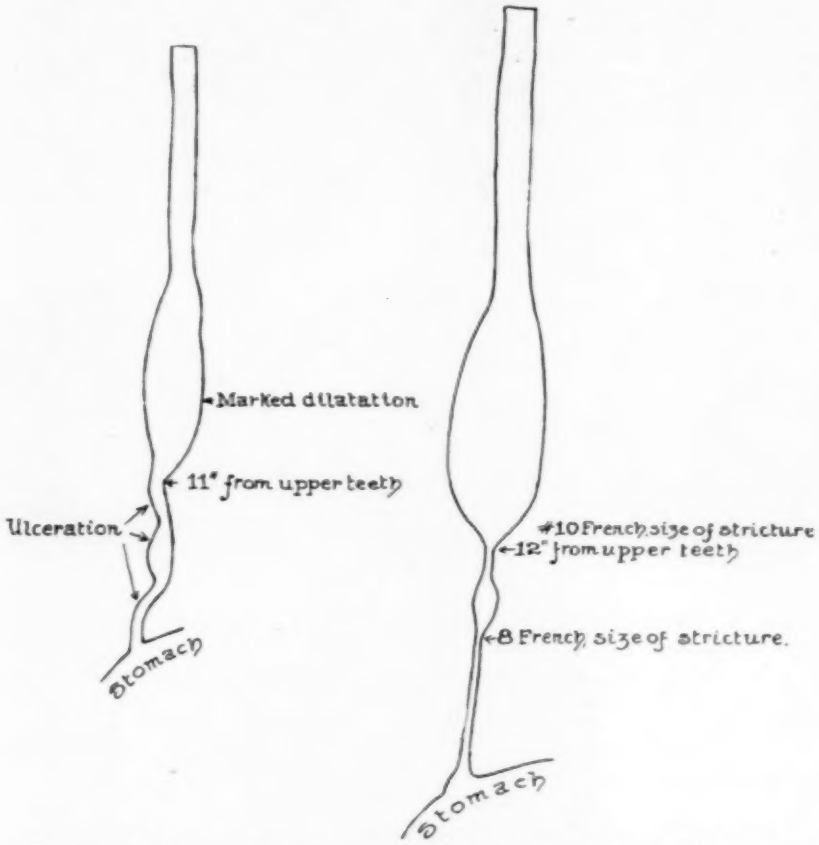

Fig. 7.—Outlines of roentgenograms in two different patients, with stricture produced by the accidental swallowing of iodin.

regarding the disastrous effects of lye on the human esophagus, are efforts that were started by Dr. Chevalier Jackson. Through this stimulus, several states in the union have passed proper legislation regarding the labeling of containers, but there is still a great deal of work to be done in this direction. This work is being done by the Lye Legislation Committee of the American Medical Association under the supervision of Dr. Chevalier Jackson.

Case 3.—A woman, aged 25, had had difficulty in swallowing for five years previous to the first examination, which was in August, 1921. During that time it was a rare occurrence that she did not regurgitate at least half of every meal. Physically, she was in very good condition except for the annoyance of a mass that formed in the lower part of the neck after each meal and the regurgitation of food. After regurgitation of part of her meal, this mass in the lower part of the neck would disappear. The mass was the dilatated esophagus.

Esophagoscopy showed several small ulcerations in the cardia. These were cauterized and the patient was put on a light fluid diet consisting mainly of strained soups, meat juice, eggs and fruit juices. Bismuth subcarbonate was also given in 5 grain doses four times daily. A week later, esophagoscopy showed that the ulcerations were healed and the cardia was dilated up to 50 French. She was apparently cured, but within six weeks all the symptoms recurred. Esophagoscopy showed an ulceration at the hiatus. This was cauterized with 25 per cent. silver nitrate, she was again placed on a liquid diet, as before, and within ten days esophagoscopy was again performed. The ulceration healed, and again dilation was gently performed. The dilation was repeated at intervals of a month, for three months. This treatment was instituted in the early part of 1922, and the patient has remained cured since then.

Figure 8.

Figure 9.

Figure 10.

Fig. 8.—Congenital dilatation of the esophagus showing the lower part of the esophagus just above the stricture.

Fig. 9.—Congenital dilatation of the esophagus showing the stricture in the lower part of the upper half.

Fig. 10.—Congenital dilatation of the esophagus, showing the sacculation of the lower part, the mucous membrane of the upper part being pink and that of the sacculation being a deep red.

Case 4.—The patient was a woman, aged 20. About one month previous to examination she had an attack of gagging and regurgitation of food, and a slight amount of blood appeared. Since the onset of the original regurgitation, she has had a regurgitation of food and mucus at least once during the day. The roentgenogram shows a cardiospasm and some slight dilatation of the esophagus.

Esophagoscopy was performed on June 26, 1923, under a general anesthesia because of the extreme nervousness of the patient regarding instrumentation. A small ulceration about 2 cm. long and 0.5 cm. broad was seen in the hiatus. This was cauterized with 25 per cent. silver nitrate, and the hiatus was dilated with a Mosher mechanical dilator up to 55 French. A week later, an oval-shaped flexible 50 French bougie was passed.

The symptoms disappeared completely and there has never been any recurrence. It seems that in both of these cases the ulceration was the exciting

cause of the cardiospasm, and, whether the cure was due to the healing of the ulceration or to the dilation, one would be inclined to feel that with the healing of the ulceration the spasm ceased.

CASE 5.—This patient, a woman, aged 20, gave a history of regurgitation of food for over ten years. She had lost considerable weight and her condition was diagnosed as cardiospasm. Gastrostomy was done and the hiatus was

Fig. 11.—Congenital dilatation of the esophagus, showing the upper dilatation, the kinking in the midportion, and the sacculation below. This was taken in January, 1925.

dilated through the stomach. The patient did not improve, and, on esophagoscopy, a stricture was seen. This was gradually dilated, using the Mosher mechanical dilator, and the patient almost immediately began to gain weight. The gastrostomy wound was permitted to close. In all, four dilations were done, on the last two occasions using a 50 French dilator.

This woman is now working and appears to be in good physical condition. A cure cannot be reported as yet, for the last dilation was performed on May 14, the previous one having been done six weeks before, on April 2, 1925.

CASE 6.—A man, aged 67, a pedler, had always been in good health up to seven weeks prior to examination, in May, 1925. While selling some wares he suddenly became unconscious. This lasted but for a few moments, and on recovery it was found that he was unable to swallow. Within a short time

Fig. 12.—Congenital dilatation of the esophagus. The roentgenogram was taken on May 16, 1925, and shows approximately the same findings as that of January, 1925, although the patient's symptoms have disappeared completely and she has gained 18 pounds.

he developed delusions and hallucinations, his chief complaints being that he could not see, that he had no soul, that he was dead, and being dead he did not need food and therefore there was no necessity to swallow. However, his family, by argument and persuasion, convinced him that drinking was not eating, and managed to keep him alive with concentrated foods.

Fig. 13.—Misinterpreted roentgenogram and endoscopic findings; diagnosis having been given as that of carcinoma of the esophagus (Case 6).

Fig. 14.—Negative roentgenographic findings and diagnosis given as that of carcinoma of the esophagus (Case 7).

Fig. 15.—Foreign body, chicken bone, removed from the esophagus (Case 7).

The roentgenogram taken at this time was interpreted to show some lesion in the esophagus, and the patient was placed in a general hospital where he was under observation for three weeks. Esophagoscopy was performed and the diagnosis of carcinoma of the hiatal end of the esophagus was made.

This diagnosis caused considerable consternation in the patient's family. On examination, the patient presented the general appearance of one dis-

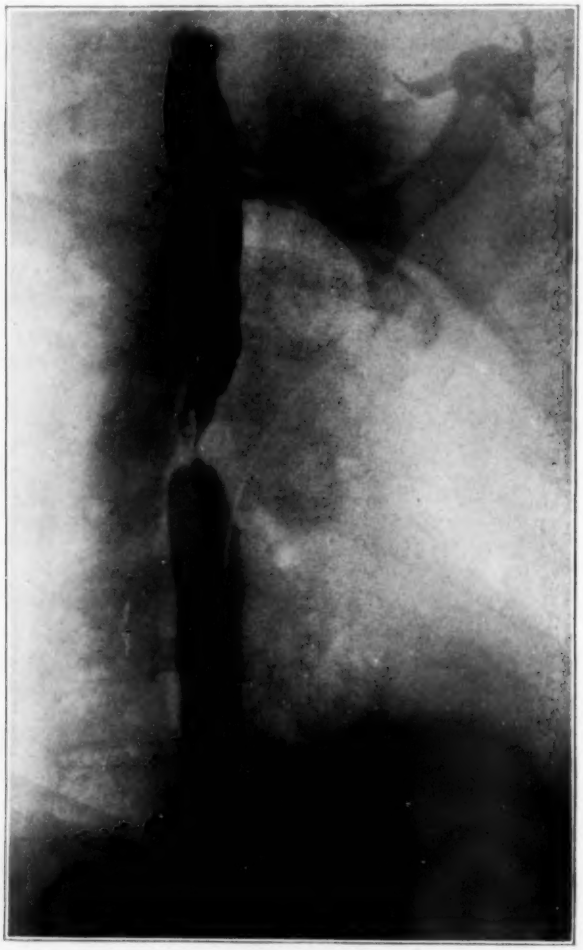

Fig. 16.—Mediastinal tumor producing almost total occlusion of the esophagus. Esophagoscope had never been done on this patient, the esophageal wall being exceedingly thin and the danger of perforation too great to compensate for what would be gained by endoscopy.

orientated; a confirmation of these findings by a neurologist resulted in a tentative diagnosis of a senile psychosis, and institutional treatment was advised.

Examination of the esophagus at this time was entirely negative, which disagreed with the roentgenographic and the previous endoscopic findings.

The man made an uneventful recovery after three months' sojourn in a state asylum, and is now back at work. He eats three meals a day, and his psychosis has entirely disappeared.

Case 7.—Mrs. D. S., aged 57, of foreign extraction, who could not express herself very well, was seen in October, 1924. She gave a somewhat indefinite

Fig. 17.—Carcinoma of the esophagus, showing the esophagus with irregular nodular growth, the depression which was an ulceration and into which the large mass fitted. This patient died two days after endoscopic examination and it was at first thought that a perforation of the esophagus had occurred. However, this was not the case, the patient succumbing to pericarditis.

history of having swallowed a chicken bone about four weeks previous to examination. A careful history of all the symptoms from the onset was gone into, and it seemed likely that a foreign body was the cause of her trouble, and an endoscopic examination was proposed. She had been examined on three different occasions by the direct method; the last time the examiner

thought that from the appearance of the mucosa and not finding a foreign body, that he was dealing with a malignancy of the upper esophagus, and the patient was referred to me for confirmation.

Having been told that possibly she had a cancer of the throat, the patient was in an extremely depressed mental state. She spat up some blood within the last few days, and this seemed to confirm her physician's diagnosis.

On esophagoscopy, a foreign body was seen tucked in the grasp of the lower part of the cricopharyngeus and almost covered by an edematous mucosa. The foreign body was easily removed with a rotation forceps, and proved to be a chicken bone.

The patient made an uneventful recovery, leaving the hospital in an entirely different frame of mind than on entering. She telephoned me a few days later and said that she had eaten a goodly portion of her favorite dish—"gefilte fiisch."

A careful history, even in the presence of a negative roentgenogram, is of prime importance when one is dealing with the possibility of a foreign body. It is possible that had roentgenography been done after the patient had swallowed a bismuth capsule, more positive findings would have been obtained.

CASE 8.—A. W., aged 25, complained of difficulty in swallowing, some pain on coughing, and at times a radiating pain down the right arm.

Both the roentgenographic and endoscopic examinations were negative, excepting that Jackson's sign of esophageal obstruction was present, that is, a collection of saliva in the pyriform fossae.

This patient developed signs of a spinal cord lesion later, and a neurofibroma was removed from the spinal cord in the region of the seventh cervical vertebra. This occurred five years ago, and the patient has entirely recovered. This case can be placed under the category of "unusual cases."

Two other cases that were diagnosed as the syndrome of Avellis presented negative roentgenograms but showed a partial paralysis of the esophagus on the same side as the laryngeal paralysis. Both of these patients were unable to swallow. Following the esophagoscopy, both patients swallowed. No anesthesia was used, and the only explanation that can be advanced why they swallowed better after esophagoscopy was that the spasm of the unaffected side was overcome.

CONCLUSIONS

Esophagoscopy as a routine procedure and method of investigation should be done frequently. Roentgenograms greatly aid in the proper performance of the endoscopic work. Specular esophagoscopy and, more particularly, the use of the Hasselinger directoscope in examinations of the hypopharynx and of the posterior part of the larynx, is of great assistance.

Biopsy should be done when the growth is within the lumen of the esophagus. If carcinoma cells are found the diagnosis is certain. However, a negative biopsy as regards carcinoma in the presence of positive clinical findings and visual examination, simply means that the growth or malignancy was not reached. So far as I know, no evil results have ever been seen following a biopsy in the esophagus. In this connection it seems that otolaryngologists have sometimes made the error of calling a partial or incomplete operation a biopsy.

It can easily be seen that there is danger in doing a biopsy on a soft encapsulated tumor, but in the esophagus, as in the larynx, most of the malignancies are extruding masses from a base located in the wall of the esophagus or larynx.

A DEPARTURE IN THE MANAGEMENT OF INFECTIONS OF THE SIGMOID SINUS

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In acute mastoiditis, two outstanding complications distinctly menace the life of the patient. They are meningitis and thrombosis of the sigmoid sinus, with its resultant septicemia. Several factors enter into the development of a sinus thrombosis. Briefly they are: 1. The difficulty of spontaneous drainage of the mastoid cells after they become infected. 2. The close relation of the sinus to these pent up infected cells. 3. The momentary arrest of the blood stream within the sinus during each inspiration. 4. The selective action of certain types of bacteria within the infected mastoid cells on the blood elements.

It is quite evident that this channel is a perilous stage for the blood in its return from the brain, and when infection is present within the mastoid, there is no point in the circulation at which the blood stream meets with more hazards.

Since these factors are constant and unchangeable, we may as well accept them and divert our attention to the extension of the infection in the formation of the thrombus, which is the immediate forerunner of the septicemia. The formation of the thrombus may be divided into three stages:

1. An infection of the bone adjacent to the sinus wall.

2. An invasion of the vessel wall or vasculitis.

3. Following the vasculitis or phlebitis, the infection extends through the vessel wall to the blood contents within and forms a thrombus.

In the beginning this is a mural or peripheral thrombus, so that there may be considerable dissemination of bacteria into the circulation with each heart beat.

After the thrombus becomes complete there is a blocking off of the circulation, and bacteria are freed into the blood stream only from each end, due to the disintegration of the infected clot. This frequently leaves a quiescent stage when the patient appears to be improving.

These stages present a variable clinical picture and it is frequently impossible to diagnose each one prior to operation. Since a patient with thrombosis of the sigmoid is free from pain, and usually has a feeling of well being, due to his cerebritis, it is well to pay strict attention to such details as chilly sensations, moderate fever fluctuations, sweats, and above all, a sudden increase of the leukocytes which remain high.

The early recognition of these points should prevent any unnecessary operative delay, and is vital in the success of the operation which I shall describe.

The presence of chills, leukocytosis, and sharp fever fluctuations is evidence of a septic explosion with a bacteremia. When the streptococcus is the offending organism, the infection usually involves the sinus wall. Either the adjacent bone is completely liquefied and the sinus is covered with heaped up granulations, or the bone is soldered firmly to the sinus. Fortunately, nature is able to retard the invasion at this point in all but a small percentage of cases.

PROCEDURE

Before presenting a new method of managing this complication, it may be well to mention the accepted methods of attack.

First, there were such timid and useless procedures as needling the sinus, small incision without obliterating the lumen of the vessel with a pack, and then the surgery of this area proceeded boldly to resection of the sinus and jugular bulb as well as ligation and resection of the internal jugular vein.

In spite of the surgical advances, the mortality reduction failed to keep pace, especially when one takes into consideration the reported recoveries of patients who may not have had an infected thrombus, and those who recover spontaneously without any operation.

Other factors than the mortality rate have proved to me that incision of the infected sinus and removal of the clot is to be avoided if possible. In working with sharp heavy instruments in the bone around the sinus, the normal wall is occasionally torn. From my own observations I have seen this accident followed by sinus thrombosis, septicemia and death. Unintentional opening of the sinus during a mastoidectomy has always been considered an extremely dangerous accident. Therefore, if opening into an uninfected sinus produces such drastic complications, what about opening through an already infected vessel? Granted that the thrombus is removed, what is going to happen to the newly formed clots at each end of the sinus which are held firmly in place by tight plugs which not only prevent drainage, but are of necessity inserted into infected bone? These thrombi do become reinfected.

Considering these previously described factors I have departed from the radical opening of the sinus, and even when the clinical findings are an infected thrombus with chills, sharp temperature fluctuations, leukocytosis, sweats, etc., I have limited the surgery to uncovering the vessel thoroughly until the normal sinus is reached, inserting a short gauze wick drain—not a pack—and leaving the wound wide open

(Thrombus cases which have developed following an accidental tear of the sinus and late extremely septic cases are obvious exceptions.)

If the septic symptoms continue beyond forty-eight hours postoperative, then without any anesthetic whatever, the exposed sinus can be thoroughly opened and drained. (See Case 6.) This two stage procedure, when necessary, also has the advantage of reducing the virulence of organisms within the mastoid process.

I am convinced that the forty-eight hours delay does not add greatly to the hazards of the patient, and is of inestimable value in the differential diagnosis of pyelitis, endocarditis, pneumonia, malaria, erysipelas, and other conditions which at their onset may present the exact clinical picture of a septic thrombus.

The convalescence, when response is immediate, is no longer or different from the usual postoperative mastoidectomy.

The question immediately arises, Did these patients ever have a sinus thrombosis? I am unable to say. We have as yet no method of diagnosing intravascular conditions without opening the vessel. I can say, however, that they did have all the clinical symptoms, even the rigors, which are always considered as proof positive when occurring with the other symptoms.

The following cases are illustrative of the findings and results of this departure, and while too few in number to warrant positive conclusions, yet they do suggest what I believe is an improvement in the management of a difficult problem.

REPORT OF CASES

Case 1.—C. Mc., a youth, aged 17, who had measles, seven days after admission to the hospital developed acute otitis media. The drum was incised and there was free bloody discharge with relief of pain. The temperature, which had been elevated to 103 F., came down to 100 F. the following day and remained at about that level for six days, when suddenly the patient had a severe chill, the temperature arose to 105.3 F., the leukocytes increased to 24,000. The following day the temperature fell to normal, the patient had another chill, and another sudden rise in temperature to 105.2 F., at which time a complete mastoidectomy was done. A badly infected sinus wall was uncovered, but was not incised. The wound was left wide open. The patient had a postoperative temperature rise of 105 F. which fell to 99 F. the second day, arose to 102 F. the two succeeding days and then remained normal. There was nothing unusual in his convalescence.

Case 2.—A. L., a girl, aged 10, when first seen had been treated for earache for a week. She was having much pain at night, and had chills and sweats for three successive days, the temperature ranging between 99 and 103 F. The entire mastoid process was quite tender, the drum was red, thick and bulging, and when incised, bloody, purulent exudate gushed forth. This relieved the pain but the temperature fluctuations and chills continued. Urinalysis showed from 4 to 5 pus cells per high power field. The leukocyte count when she was first seen was 20,000, three days later it was 24,200; the respiratory rate varied from 26 to 30; the pulse rate was 110.

A mastoidectomy five days later revealed a badly infected mastoid process extending down to the sigmoid sinus which was not covered by any granulations,

but which was acutely inflamed over its entire exposed area. A drain was inserted over the unopened sinus and dressings were applied. The first postoperative day the temperature arose to 102 F., the leukocytes went to 31,000, and the following day the temperature fell to normal where it remained during the entire convalescence.

The only disturbing factor was the leukocyte count which was 37,000 the second postoperative day, 29,000 the third postoperative day, and 18,000 the fourth. The mastoid wound healed normally and the patient has not had any disturbance since.

CASE 3.—R. W., a boy, aged 12, when first seen, March 6, 1924, was having a severe chill, his ear had been discharging for about a week, causing much pain. The two preceding days he had had chills and the temperature fluctuated from 100 to 104 F.

Aside from the ear, his physical findings were negative, he had 26,000 white blood cells, and a normal urine. The following morning he was operated on. A badly infected sinus was uncovered. After cleaning out the overlying infected mastoid cells, a gauze drain was placed in the wound which was not sutured.

The evening of the operation his temperature dropped to normal, and did not again go over 99 F. The leukocytes were 25,000 that day, 20,400 the following day, 12,600 a day later, and on the fifth postoperative day were 8,600. His recovery was uneventful.

CASE 4.—A. G., a boy, aged 5, who had been in the hospital with measles, followed ten days later by a suppurating ear, painful tender mastoid process, maximum temperature of 100 F., and a chill twelve days later with a sudden rise in temperature to 103, which for five succeeding days fluctuated between 100 and 105 F.

During this time the maximum leukocyte count was 40,000, the minimum 32,000. Blood cultures were negative. There were a few pus cells in the urine.

After repeated examinations nothing could be found which would explain this fever and leukocytosis, except the ear. The mastoid was operated on five days following the first chill. There was marked involvement of the sigmoid sinus, which was completely uncovered but not incised. A wick drain was placed in the wound which was left wide open. The first and second postoperative days the patient had a temperature of 104 F., with a minimum of 102, after which it returned to normal. The leukocytes dropped to 7,500, and the patient made an uneventful recovery. At no time were there any symptoms or signs of involvement within the chest, the respiratory rate did not exceed 30, and the urine was negative throughout.

CASE 5.—F. D., a boy, aged 12, following a rather stormy onset of bilateral suppurative otitis media was taken home to a neighboring city. A nurse accompanied him. The ear discharge diminished, but the boy made slow progress and after one week's stay at home he had a slight chill and a sudden temperature elevation to 103 F.

The following day he had another chill and was sent back to the hospital. At this time there were 18,000 white blood cells, a temperature of 103.4 F., a bilateral ear discharge, the right mastoid was quite tender, and the patient appeared toxic. The urine was negative, and roentgen-ray findings showed an equal cloudiness of both mastoids.

It was quite apparent that this patient had a beginning involvement of the sigmoid sinus, but whether one or both were involved was the question. As the findings were identical for both ears, both mastoids were opened and the sigmoids thoroughly exposed. Both sinuses were acutely involved and oozed freely from the vessel wall. Short wick gauze drains were inserted and the convalescence was uneventful.

CASE 6.—F. S., a man, aged 63, one week following an extensive mastoidectomy had a severe chill which was followed by a high fever, with 21,000 leukocytes.

As the sinus had been freely uncovered and showed marked involvement at the original operation, I decided to open the sigmoid and remove the clot without any anesthetic. This was explained to the patient and he was instructed not to leave the operating table at an inopportune moment. Free incision of the sigmoid was followed by a gush of blood which expelled a thrombus the diameter of the vessel and one-fourth inch long.

Plugs were inserted at each end of the opening to control the bleeding, and the patient was not disturbed by the operation. The fever and chills subsided and he was making a splendid recovery, when ten days later he developed lobar pneumonia and died.

Necropsy revealed a clean collapsed sinus with no extension of the infection either to the torcular or jugular end.

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Clinical Notes

NEW ESOPHAGOSCOPE FOR A FLAT FOREIGN BODY

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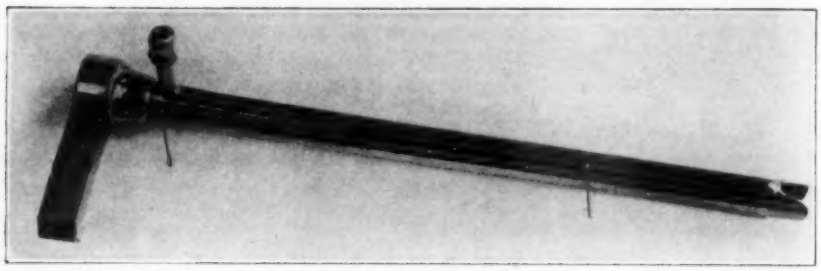
The widely used esophagoscope of the types devised by Jackson, Killian and Brünings have bevelled distal ends. Brünings' instrument differs a little from the other two in that it has a slightly slanted, undulated form. This form of the distal end fills the optical conditions sufficiently, and it is desirable to make the distal end of the tube so that this optical field is as large as possible.

The endoscopic introduction of the tube to avoid any lesion of the trachea is facilitated by this form, as has been described by Brünings in his book. According to my experience, the condition is reversed when using the esophagoscope. I find that such a slant ended tube is inserted readily only by the guidance of mandrins, because the bulging of the mucosa of the upper end of



The new esophagoscope.

the esophagus exposes this constantly in the important visible part of the lumen due to the pressure of the end, and if we push it further, this pressure often causes more or less lesion.

Since a foreign body lodged in the food passage, particularly in the case of children, is usually retained at the orifice, it requires rather careful guidance of the tube without the use of bougies. Owing to the form of the distal end already described, the usual esophagoscope has another disadvantage, namely, the danger of overriding the foreign body. In cases in which the mucosa, because of the prolonged obstruction of the foreign body itself as well as unsuccessful previous treatments, is swollen and infiltrated, one can scarcely manipulate the extracting forceps and grasp the brim of the foreign body without the risk of injuring the mucosa.

To obviate these disadvantages, an endoscope has been devised with a length of 12, 15 and 18 cm.; cross section, elliptic (diameter 0.7 : 0.9, 0.8 : 1.0, 1.0 : 1.2 cm.). The drainage canal (caliber 0.2 cm.) runs on the longer diametric side surface, and one outlet opens within the distal end so that the mucosa may not be drawn into the outlet. Its proximal outlet is at the end of the curved canal, and serves to connect to the negative and positive pressure tank. The drainage canal is made so as not to encroach on the lumen of the tube.

The oval sectional tube fits the anatomic construction of the hypopharynx, and serves the purpose of obviating mechanical pressure when inserting; it brings into sight the brim of the foreign body in a frontal position, since the distal end is cut in deeply in its longer diameter like an open duck-bill. This form of tube enables one to obviate grasping the surrounding tissue with the forceps. The square sectional handle of the tube (4.5 cm. long) is adjusted both for Brünings' panelectroscope and Killian's simple handle.

I have made this endoscope according to Brünings' and Killian's types, but it is also of greatest service for the purpose mentioned if a wedge-shaped curve at the distal end of the Jackson endoscope is made.

PROGRESS IN OTOLARYNGOLOGY

A Summary of the Bibliographic Material Available in the Field of Otolaryngology

THE PRESENT STATUS OF OUR KNOWLEDGE OF ALLERGY IN ITS RELATIONSHIP TO OTOLARYNGOLOGY *

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It is difficult to present this review of the "Recent Advances in the Realm of Allergy as Related to Otolaryngology" satisfactorily without referring to the work of previous years. Furthermore, it does not seem practical in the time and space at my disposal to quote these researches in detail nor to review those which have been published during the year 1925. For this reason, I shall present the subject as we understand it now, partly as a review and partly as an original paper, and refrain at this time from reviewing the older literature in detail and from reviewing the literature which has appeared during the year * 1925. The latter will be published next year.

Allergy is a new subject in the clinical world—in fact, a new subject which has developed with remarkable rapidity during the last few years and which has suddenly become useful practically in the cure of disease.

Early History.—Allergy, affecting as it does in slight or marked degree about 15 per cent. of all persons, must have been observed and recognized as an entity by those who treated illness, even in prehistoric times, in fact, it must have been observed and recognized even by witches who cured disease with songs and dances. Cases of allergic coryza were described in some detail by Botallus in 1565, by Schneider in 1662,

* Excellent and complete presentations of the experimental phases of the subject anaphylaxis, with reviews of the older literature, may be found in Zinsser's textbook "Infection and Resistance"; and in Coca's article "Hypersensitiveness," published in Tice's Practice of Medicine. The latter article has not been revised for several years, but contains a splendid review up to the year 1920. An elaborate and accurate review of the older literature on pollen disease on the clinical phases of the subject may be found in Koessler's article "The Specific Treatment of Hayfever (Pollen Disease)," published in Forcchheimer's Therapeutics of Internal Diseases. This article also contains a wealth of original material which is not out of harmony with facts as we know them now. More recent reviews of the clinical phases of the subject may be found in Scheppegrell's monograph "Hayfever and Asthma"; in a monograph which I have written entitled "Asthma, Hay Fever, Urticaria, and Allied Manifestations of Allergy," and in the original articles in the bibliography.

by Beningerus in 1673, by Bostock in 1819 and by many others of later date, under such terms as "rose catarrh" and "catarrhus aestivalis." Blackley, in 1856, described the condition in such detail that few, until the last few years, added materially to the facts which he disclosed. He stated that hay-fever was caused exclusively by pollen. He reproduced symptoms in himself, a sensitive person, by the application of pollen and pollen solutions to the mucous membranes of the eyes, nose and mouth. He performed skin tests through the application of dry pollen to scarified areas on the skin. This, he said, caused extreme local itching and swelling of the tissues, which persisted for about four days. He furthermore studied pollen plates, and noticed a close relationship between the number of pollen granules in the air and the severity of clinical symptoms. His results were confirmed later by Dunbar, in 1903, and by a host of observers since that date who elaborated on the facts and methods which he initiated.

With the discovery of animal anaphylaxis by Richet, developed in remarkable degree by the pioneer work of Arthus, Pirquet and Schick, Rosenau and Anderson, Otto and others, we were given basis for the remarkable advances of the last ten years in our understanding of allergy in human beings. Weichhardt, and Wolff-Eisner, in 1905 and 1906, suggested that hay-fever was a reaction of hypersensitiveness analogous to that observed in animals with anaphylaxis. Meltzer, in 1910, suggested that the bronchial constriction of asthma was a phenomena of anaphylaxis analogous to that observed in animals dying in anaphylactic shock. Koessler, in 1913, reported a case of asthma caused by hypersusceptibility to hen's egg. Following these initial suggestions, development has proceeded rapidly.

HEREDITY AND SENSITIVENESS

Heredity.—The part played by heredity, noted by Wyman, in 1872, and by Beard, in 1876, was elaborately studied by Cooke and Vander-Veer, who proved that hypersensitiveness is transmitted according to mendelian laws as a dominant characteristic, and that with bilateral inheritance, symptoms appear at an earlier age than when inheritance is unilateral.

Natural Hypersensitiveness.—Certain animals, such as guinea-pigs, can be sensitized artificially by treatment with foreign proteins. This is not the case in human beings or in monkeys. Human beings are extremely difficult to sensitize artificially. Those of allergic heredity frequently become sensitive spontaneously, however, through contact with one or more of the myriad of foreign substances that are capable of sensitizing. Once developed, the condition is likely to persist through life.

Whereas Coca, Zinsser and others state that animals can be sensitized only with protein substances, this is admittedly not true in the case of human beings. Human beings can become sensitive under natural conditions to nonprotein substances, even to inorganic substances, such as inorganic salts, and even, as will be mentioned subsequently, to the action of physical agents, such as light, heat, cold and mechanical irritation.

Degree of Sensitiveness.—The degree to which sensitiveness develops in many persons is almost unbelievable. Most poisons to which human beings and animals are susceptible must be given in material amount before severe symptoms of poisoning or death results. Exceptions to this are the toxins, such as diphtheria toxin and tetanus toxin, which are poisonous when given in doses that seem inconceivably small. The same is true of the intensity of the effect of agents to which sensitive patients react. Patients sensitive to horses, for example, may be made ill by the minute amount of dander in the air around horses. When we bear in mind how minute must be the amount absorbed in this way, we can readily understand that the degree of sensitiveness is great. A patient sensitive to glue has been known to react violently after picking up a bottle with a wet label. In pollen sensitive cases, the injection of 0.0001 mg. of pollen frequently causes reaction. The actual offender in pure state would be represented by a fraction of this amount.

Specificity of Sensitiveness.—Recent developments have thrown light on specificity in sensitiveness. A patient sensitive to one chemical body may be insensitive to other bodies which are closely related, either chemically or biologically. Patients sensitive to ragweed in one district may fail to react to the pollen of the identical weed grown in neighboring districts. Patients sensitive to cantaloup or strawberries of one district may be able to tolerate the same products grown in neighboring states. Occasionally, however, patients may give group reactions and may react to a number of agents which are related either chemically (such as morphin, codein and heroin), or biologically (such as the various types of ragweed pollen *Ambrosia elatior, Ambrosia trifida, Ambrosia bidentata, Xanthium commune and Iva xanthifolia*). Furthermore, patients who are highly sensitive to one agent may react also to agents which are not related in any sense, and may react more violently if exposed to the combined effect of several such agents than they do to the effect of one. For example, a patient sensitive to pollen may also be sensitive to a food, to an inorganic salt and even to the effect of a physical agent, such as light, heat, cold or mechanical irritation.

Passive Transfer of Sensitiveness.—A phenomenon that has occupied the minds of many physicians interested in this subject for a number of

years is the possibility of passive transfer of hypersensitiveness. This can be accomplished in animals by the transfer of serum of a sensitive to a nonsensitive animal. Whether or not this can be accomplished in human beings is a question. Sensitiveness to a given agent can be transferred apparently from mother to offspring. This must be distinguished from true heredity, in which mother and offspring are usually sensitive to different agents. Ramirez's case of apparent transfer of horse sensitiveness through direct transfusion of blood is subject to question, in Ramirez's own opinion. Many transfusions have been carried on between allergic persons in whom sensitiveness was not transferred. Preusnitz and Küster found that the skin of normal persons can be passively sensitized locally by the intracutaneous injection of serum of a hypersensitive human being, and that the sensitiveness so transferred is specific for the substance to which the donor is sensitive. Coca and his associates, Spiracke and Grove, report that the skin of a susceptible person can be sensitized in this way separately to several substances at the same time, and in the same locality, by the injection of serum of sensitive patients, and that such areas can be made to react separately to each of the substances to which he has been made sensitive. They found, furthermore, that desensitization of such skin areas was specific for the substance used. It has been shown, therefore, that while sensitiveness cannot be transferred in human beings as easily as it can be in guinea-pigs, the passive transfer of sensitiveness locally can be accomplished, and the sensitiveness so transferred is specific.

Desensitization.—Animals that have been sensitized artificially to serum and other proteins can be desensitized with great rapidity by the giving intravenously, at about ten minute intervals, of infinitesimal doses of the agent to which they react. The dose can be increased tenfold at each inoculation, so that finally a point is reached at which an animal can stand as much as one million times the amount of serum which would originally have caused reaction. This method of desensitization (Besredka's) has been recommended for use in the treatment of patients who are to receive second doses of serum. It is found, however, that it is impossible to desensitize human beings at such a rapid rate, in fact, a case of death has been reported in which pollen extract was administered intravenously in a pollen sensitive case. This difference between human beings and animals is unfortunate and can be attributed possibly to the fact that sensitiveness in man is far greater in degree than it is in animals, and to the fact, as expressed by Zinsser, that the sensitizing agents in human beings are probably attached to tissue cells rather than circulating loosely in the blood.

THE NATURE OF AGENTS WHICH SENSITIZE AND THE FACTOR OF CONTACT

Much has been written on the nature of agents which can sensitize human beings and animals. Animals can be sensitized artificially only by antigenic substances. Agents which sensitize human beings spontaneously, however, are not necessarily antigenic. Proteins which sensitize human beings are sometimes modified by gastric or pancreatic digestion and are sometimes unchanged by digestion. This was studied at length by Walker and Wetmore and more recently by Piness. Some substances, such as the ovomucoid fraction of egg, are unmodified by the effect of boiling, whereas others, such as pollen extract, deteriorate under the influence of heat.

A fact of importance concerns the "nature of contact" with foreign material. Patients rarely become sensitive to agents with which they come frequently in gross intimate contact, such as the grosser constituents of beef, egg or milk. They more frequently become sensitive to agents with which they meet rarely or meet in traces only, such, for example, as the pollens in the air, dander and foods which are rarely eaten. If they become sensitive to some constituent of a commonly eaten food, it is usually with a constituent which is contained in traces; that is, traces, such as the trace of buckwheat in buckwheat honey, the trace of egg in hen meat or the trace of rice or wheat in mothers' milk. Patients who are sensitive to substances which are met at rare intervals are, of course, rarely made ill. Such is the case in sensitiveness to pollen of a flowering plant or its perfume. Even though one may be highly sensitive to roses, a patient is rarely made ill by them because of the rareness of intimate contact. Patients who come in frequent contact with traces of substances to which they react, may have a chronic, almost unremitting illness.

AGENTS WHICH SENSITIZE HUMAN BEINGS

The agents most commonly responsible for reactions which interest the otolaryngologist are:

Pollen of All Varieties.—This varies in different districts. The pollen usually responsible for illness in a given district is the pollen produced in greatest abundance over the longest period of time. Tree pollen is commonly responsible for early spring cases, the grasses for summer cases and the weeds for the fall cases. The pollen of flowering plants, such as golden rod, the daisy, the dandelion, and cultivated flowers, and also the pollen of cereal producing flora, such as wheat and oats, is rarely produced in sufficient quantity to be a factor in the causation of illness, except in a case of persons who come in intimate contact with the plants.

Pollen is rarely encountered in sufficient quantity under natural conditions to give rise to tolerance. Consequently, when a person is once sensitive to pollen, the illness is likely to persist through life, unless the patient moves to a different geographic district or obtains tolerance through treatment.

Products of Vegetable Life Other than Pollen.—This includes substances derived from every part of plant life, the bloom, stem, root and seed. Even the distillation products of wood and of coal frequently sensitize and cause illness. Orris root is worthy of special emphasis, since it is used so frequently in toilet articles, cosmetics, tooth paste and perfumes, and is a frequent cause of reaction.

Products of Animal Life.—This includes not only hair, feathers and dander, but also foods. Patients sensitive to animal or fowl are not necessarily sensitive to fur or feathers. Furthermore, patients sensitive to unrenovated fur or feathers may not be sensitive to the cured product.

Smoke.—Every variety of smoke can sensitize and cause reaction. Patients may be specifically sensitive to several types of smoke, or to one specific variety, or even to the smoke of one specific article burning under conditions favorable for the elaboration of one specific product to which they react. A patient sensitive to cigar smoke may be unaffected by cigarette smoke, and vice versa.

Dust.—Patients may be sensitive to one or to several types of dust. They occasionally react to one type only, in fact, occasionally to the dust obtained in certain houses and not to that in others. The importance of this has been particularly emphasized by Cooke, who devised a splendid method of testing with the intracutaneous injection of a filtered extract of dust.

Foods.—Patients may be sensitive to one or to several foods. As previously mentioned, they usually react to foods which they encounter rarely, or to those which if encountered often, are taken in traces only. A complete study of the proteids of foods which commonly sensitize has been made by Walker, and by Wodehouse and Olmsted, and of the chemical makeup of proteids which sensitize animals by Wells and Osborne and others.

Drugs.—Many of the drugs are capable of sensitizing. Most interesting are the alkaloids, including morphin, codein, heroin, quinin, atropin, cocain, procain and apothesin; the coal tar antipyretics, especially acetylsalicylic acid; the arsenic containing drugs, such as arsphenamin and neo-arsphenamin; and even inorganic salts, such as the iodids and bromids. Patients are occasionally sensitive to and made ill by impurities in the drugs, such as a patient who was sensitive to only one of

five varieties of acetylsalicylic acid. Most patients poisoned by local anesthetics are hypersensitive to them and react even to traces of the drug.

Bacteria.—The part played by bacteria in the symptomatology of allergy has been discussed at length. The prevailing opinion at the present time, is, I believe, that sensitiveness to bacterial products actually occurs, but that this is rarely a cause of prolonged illness. In infection the patient is intimately exposed to foreign material with which he does not ordinarily come in contact. This should sensitize him. However, the very contact which sensitizes him should give him tolerance. Therefore, even should he become sensitive, he should soon gain tolerance through intimate contact and cease to react. The condition which should cause him to cease to react is exactly analogous to that which obtains during the successful treatment of pollen disease with pollen extract.

Severe allergic symptoms frequently accompany acute infectious diseases, such as tonsillitis and scarlet fever. These symptoms, however, are rarely prolonged. They usually disappear within a week or ten days. It seems more than likely from the experiences of Walker and others that bacterial allergy does exist. According to Cooke, Koessler, Rowe and others, however, it is not commonly encountered.

Insects and Animal Parasites.—Susceptible persons rather frequently become sensitive to the products of an insect or animal parasite. In this case, they may react violently whenever exposed. Canby Robinson reported a case of severe illness following the sting of an insect. J. R. Newman related to me a case of a child in which death occurred less than one minute after the sting of a wasp.

Therapeutic Serums.—This is discussed not so much because of illnesses in the nose and throat which come as a result of treatment with foreign serums, as because of the fact that laryngologists are frequently called on to see and treat diphtheria. The fact that anaphylaxis might occur in human beings as a result of treatment with foreign serums was recognized and emphasized by Rosenau and Anderson. When this possibility was suggested, a relatively small number of deaths were observed after the administration of antitoxin and attributed to this cause. Coca emphasizes the fact that naturally acquired hypersensitiveness to horse serum is a greater menace in the use of serums than that which might be caused by a previous dose of serum; in fact, he states that if a patient tolerates one dose he ought to be able to tolerate a second. Boughton reported a case of death following the intravenous injection of one drop of horse serum in a patient who had not received a previous inoculation. Several fatal issues have been reported, following a first subcutaneous injection of 1 c c. of horse serum.

There are apparently two factors concerned in reaction to foreign serums: first, reaction caused by naturally acquired hypersensitiveness to horse serum—this gives rise to reaction after a first dose; second, serum sickness which commonly follows a first or second dose of serum in normal persons. Serum sickness may follow a first dose, but the illness following the second dose is likely to come more quickly and to be more severe (Pirquet and Schick).

Patients who are sensitive to horse dandruff are not necessarily sensitive to horse serum. This harmonizes with the experience of Wells and Osborne, who show that animals which are sensitive to certain proteins of seeds are not necessarily sensitive to other proteids extracted from the same species of plant.

If physicians are acquainted with the dangers attending the use of therapeutic serums in sensitive patients, the dangers should be reduced to almost nil. Fortunately, children stand serums and other such foreign agents better than adults, and are less often sensitive to serum than adults. Probably for this reason death, following the promiscuous use of serum in human beings, seldom occurs. As age advances, the likelihood of reaction is greater. For this reason, inquiry should be made as to the possibility of natural hypersensitiveness to serum before it is administered, especially in adults. This, as a rule, can be accomplished without great effort. One should inquire first concerning a family history or past history of hay-fever, asthma, hives and eczema, and for the possibility of horse asthma. If a positive history is obtained in either case, serum should not be used unless indications justify a risk. If this is the case the patient should be tested intracutaneously with 0.01 c.c. of horse serum, or better, as Cooke suggests, by a conjunctival test with horse serum. Even in the case of a negative result, serum should be used only in case the illness justifies a risk, and then the dose administered should be reduced to the smallest quantity compatible with a good therapeutic result. This quantity is actually much smaller than the dose ordinarily advised in the treatment of diphtheria. The patient should be watched, and in case of reaction, atropin and epinephrin should be used freely.

In the case of a positive test, serum should not be used unless the illness justifies a serious risk. Often the dangers from diphtheria, however, exceed the dangers of reaction even in horse sensitive cases. A physician of my acquaintance, who has a severe case of horse asthma, twice tolerated large doses of antitoxin. Park finds that patients who give positive skin tests to horse serum have tolerated large doses (from 5 to 10 c.c.) of serum intravenously.

It must be admitted by all that with diphtheria in a patient sensitive to horse dandruff, the situation is serious and that one must make a

choice between two risks. This is true not only in the case of proved horse sensitiveness, but also in the case of persons of allergic strain who may give negative tests to horse serum. Coca is right in pointing out the danger of the older procedure of giving a preliminary dose of 1 c.c. of horse serum in an effort to desensitize the patient, and even in warning against the routine use of his own method, which consists of the giving of antitoxin in 0.1 c.c. doses, repeated at thirty minute intervals with great care, and increased in quantities not exceeding 0.1 c.c. at each dose, if the reaction of the patient permits. I do believe, however, that Coca's procedure offers the best chance of escape from an emergency in proved cases of diphtheria which we have at present, especially if it can be modified to suit the situation.

Prophylactic doses of antitoxin should not be used in patients sensitive to horses.

Blood Transfusion.—Direct transfusion of blood is a safe procedure in nonallergic persons, if the donors are carefully chosen. In patients who have allergy, however, there is an increased liability to reaction, so that it becomes necessary to decide whether the benefits to be gained from transfusion offset the dangers coincident with reaction. In one case, a patient was sensitive to a food eaten by the donor and reacted violently on the introduction of the first syringe of blood. In patients who give a past or family history of hay-fever, asthma or hives, transfusion, if indicated, should be given with great slowness, and epinephrin should be on hand ready for rapid use.

The Amins.—The part which may be played by some of the amins, especially histamin and tyramin, in the development of anaphylaxis-like symptoms is interesting. Brodie and Dickson showed that muscarin is capable of producing violent bronchial constriction in animals. Barger and Dale, and later Dale and Laidlow, carried on extensive experiments proving that the injection of histamin into guinea-pigs gives rise to symptoms almost identical with those observed in anaphylaxis. Eustis demonstrated histamin in the Charcot-Leyden crystals and suggested that this was the cause of the bronchial constriction of asthma. He also produced hives in himself by the application of a solution of histamin to a scarified area on the skin. Ackermann found that histamin is derived from histidin through the action of putrefactive bacteria. Wells points out that histidin can be found in every normal proteid. Koessler finds that the contents of the normal colon contain a lethal dose of histamin, and explains its failure to intoxicate by assuming that the normal mucous membrane of the colon does not permit its absorption. Koessler finds further that the filtrates from certain cultures of bacteria contain substances other than histamin which are capable of causing constriction of nonstriated muscle. The part which may be actually played by such

agents clinically is not yet proved. Symptoms resulting therefrom should not be classed as allergy, for they do not depend on previous sensitization of the patient.

Contributory Causes of Reaction.—Many agents contribute to reaction caused by other substances. This, however, is believed to be specific more often than nonspecific. Agents that have been mentioned in this connection are mechanical and chemical agents, light, heat, cold, functional activity, reflexes, emotional disturbances, pregnancy, menstruation, disorders of the endocrine glands, nasal defects and organic or functional disorders in the alimentary tract, etc. In spite of the apparent secondary effect of agents of this sort, it is believed that their effect is more often primary than secondary; at least, that they are either a primary cause of disorder, or a secondary cause chiefly because of the fact that they bring the patients in intimate contact with some agent to which they actually react specifically. This will be discussed at greater length subsequently.

RELATIONSHIP BETWEEN ALLERGY AND OTHER ILLNESSES

Patients with allergy differ from normal persons in that they are predisposed to certain diseases and enjoy relative freedom from others. This does not apply so much to pollen sensitive cases as it does to the perennial cases in which the following conditions are unusually common: goiter, obesity, hypertension, hypotension, achylia gastrica, bronchopneumonia, nasal polypus and acute and chronic nasal sinus infection.

Whereas these illnesses are unusually common, syphilis and tuberculosis are unusually rare. Among 500 patients with allergy of all varieties who were carefully studied, only nine had active syphilis, and all responded well to therapy. They were cases of long standing, but not one showed evidence of involvement of the nervous system. This is actually very different from statistics obtained in nonallergic persons. In these the incidence of syphilis is much greater, and of the chronic cases, at least 50 per cent. show involvement of the nervous system. Of 500 patients with allergy, only eight showed evidence of active tuberculosis, less than 2 per cent. Only one of these cases has terminated fatally. This stands in marked contrast to statistics obtained in a similar study of nonallergic persons. Among these, tuberculosis was found in about 8 per cent. of the cases. Evidently persons of allergic diathesis enjoy a relative immunity to chronic infections, such as syphilis and tuberculosis.

SYMPTOMS OF REACTION

The symptoms of reaction of surface membranes, such as the mucous membrane of the nose or bronchial tubes, may occur as a result of contact between the surface tissues and some air-borne material, or may occur as

part of a general reaction after a foreign substance has been absorbed and distributed by the blood stream. Either type of reaction may be immediate or delayed or may appear as a so-called solitary reaction; that is, a reaction which is intensified greatly in certain areas.

Symptoms vary greatly in their intensity; in fact, from a condition so trivial as a tendency to sneeze or cough, to bronchial asthma which may be of such severe grade as to cause emphysema, deep cyanosis and even rupture of the lung, with spontaneous pneumothorax. Variation in the intensity of symptoms depends on the degree of sensitiveness of the patient and the intensity of contact with the agent to which he reacts.

In many cases, symptoms have a strange tendency to occur periodically. In a case of nasal reaction, for example, attacks occurred for a period of years at exactly seven day intervals, and seemed independent of the environment or habits of the patient. Symptoms frequently occur at yearly or seasonal intervals, frequently at twenty-four hour intervals with great regularity, less often at twelve hour intervals and occasionally at shorter intervals, such as four hour intervals. Many attacks are prone to occur at certain times of day. Night attacks are often caused by sensitiveness to heat, and occur only at times when the body temperature is lowest.

Symptoms frequently undergo transmutation in the most interesting way. For example, hives may disappear, to be followed by angioneurotic edema or asthma. Nasal reactions may disappear, to be followed by asthma, and vice versa. In one patient allergic eczema and asthma alternated in a most interesting fashion.

General Symptoms: Shock.—Local or contact reactions, such as hay-fever, are usually accompanied by slight manifestations of general reaction, such as eosinophilia. This is due apparently to the absorption of a small amount of substance which offends locally. When a patient is excessively sensitive, when exposure is intense or when the local reaction covers a large surface area, the general reaction may be severe, but rarely alarming. This fortunately is rare. In my experience, it has occurred in rare instances after natural contact with animals or with fish glue, after the handling of fish, after the ingestion of foods or drugs to which the person is hypersensitive, after subcutaneous, intravenous, and intracutaneous injections, and even after scratch tests. Typical illustrations of general reactions are those which occur at the beginning of or during a blood transfusion, during or soon after the injection of therapeutic serums, pollen extract or drugs, or after insect bites in excessively sensitive persons.

With the onset of reaction, the patient usually complains first of generalized itching, followed within a few moments by pain in the top of the head, pain in the lower spine, or both, and within a few moments

by a feeling of total collapse in which he thinks he is going to die. Pain in the back and head may become so severe as to cause the patient to cry out. General erythema and itching may become intense. The face and tongue may swell, and the patient becomes slightly or markedly asthmatic. Blood pressure usually drops, and may reach an extremely low level. The pulse becomes weak and compressible, and occasionally almost imperceptible. On appropriate treatment with epinephrin and intravenous injection of caffein, if indicated, recovery is usually prompt and complete; in fact, in every case of shock which I have observed the patient has recovered promptly under this medication. Severe reactions, untreated, usually show improvement within thirty minutes. In some cases, which come on slowly, however, especially if the reaction is delayed for one or several hours or days, it may last a number of hours. In the latter case, hives and angioneurotic edema usually dominate the situation, and the condition resembles serum sickness.

One cannot conceive of the sudden stormy nature of constitutional reactions unless he has observed them. Such occur frequently in natural life as a result of accidental contact with agents to which patients are excessively sensitive. I am sure that this contact is responsible for a relatively large proportion of sudden deaths in apparently healthy persons which are classified by physicians and coroners as "cause unknown," "heart failure," "embolus," "hemorrhage" or "status lymphaticus." It is not uncommon to hear of persons in apparent health after a hearty meal having an attack of nausea, vomiting, pain, collapse and death within a few minutes. The dangers to which highly sensitive patients are subjected are great.

Whereas stormy symptoms, such as those just described, are observed occasionally, the milder symptoms of reaction are every day occurrences and bring patients to doctors' offices with varying complaints, probably as often as any other illness. The milder reactions include one or many of the symptoms to be described subsequently.

Orbital Symptoms.—These include puffiness and itching of the lids, slight redness of the lid margins, edema of the conjunctivae and increased lacrimal secretion. This reaction may vary in intensity from slight itching of the lids to edema which may nearly close the orbital apertures. When it occurs alone or is associated with nasal reaction, it is almost always the result of surface contact with some offending agent. Ocular reactions occasionally occur as part of a general reaction, however. This is often the case when swelling is gross, and when the skin of the face is also involved.

Severe reaction may simulate nasal sinus infection, or even sinus thrombosis, but can be easily differentiated from them by the absence of fever, leukocytosis and tenderness, and often by the presence of other general manifestations or reaction.

Nasal Symptoms.—Sneezing, pale swelling of the mucous membrane of the nose, associated usually with excessive watery or clear mucous secretion, are the usual nasal symptoms. This reaction may vary from slight annoyance to complete stoppage of the nose associated with an outpouring of secretion which may drench towels. It is occasionally associated with frontal headache, caused by pressure in the nasal sinuses, or by pain in the top of the head, occurring as a direct result of general reaction.

Nasal reactions occurring alone or associated with coryza or bronchial asthma suggest the reaction of surface contact with an air-borne substance. Nasal reactions rather frequently occur, however, as part of a general reaction, in which case they are likely to be associated with other symptoms of general reaction.

Nasal reactions are prone to occur in patients subject to general reaction who have sinusitis or bad mechanics in the nose. In this case, the allergic element may not be apparent and can easily be overlooked. Furthermore, chronic edema of the nasal membranes caused by allergy predisposes to sinus infection and makes worse obstruction, due primarily to bad mechanical conditions.

Chronic edema of the mucous membrane in perennial cases frequently results in polypi (in 24 per cent. of the cases). In patients having multiple polypi, chronic allergy must be suspected first and foremost as the primary etiologic factor. It is unusual, however, to find polypi in uncomplicated seasonal cases (about 6 per cent. of the cases). The presumption is that the duration of edema in seasonal cases is too short to give rise to this result; that is, that the membrane can return to normalcy during the well period.

The foregoing facts are important from the standpoint of local treatment, for in the case of nasal reaction, local treatment, especially surgical treatment, does not reach the root of the evil and often does much more harm than good. I cannot warn too strongly against unnecessary nasal surgery in allergic cases. The after-result of a trivial, carefully done operation is often pitiful. Allergic patients are different from normal persons and have to be handled differently, especially when nasal surgery is concerned. This has been emphasized by Pinness and others. In one of my patients, severe chronic asthma commenced immediately after a carefully done submucous resection of the nasal septum. Several of my patients have had repeated nasal operations and, at the present time, have almost countless polypi.

The foregoing statements do not apply to polypi occurring in one cell or one group of cells. In this case, infection is more often the cause.

Pharyngeal and Oral Symptoms.—Itching of the soft palate and pharynx, cough, less commonly edema of the uvula and soft palate and

swelling of the tongue are the usual oral and pharyngeal symptoms. The symptoms may vary in severity from slight annoyance to intense itching, and even to swelling of the soft palate, which may seriously obstruct respiration and require drastic measures for relief. The milder reactions occur frequently as a result of surface contact. The more severe reactions, associated with edema, are usually the result of constitutional reaction.

The condition can be easily mistaken for infection, unless the general characteristics of this type of reaction are borne in mind.

Laryngeal Symptoms.—These include cough, hoarseness and pale edema of the membranes of the larynx and epiglottis. This may vary in severity from simple hoarseness and cough to edema, which may embarrass respiration and require tracheotomy. In one case of reaction of unknown origin, swelling of the epiglottis and false cords reduced the size of the passage to such an extent that it would hardly have admitted a body with the diameter of a match. Before tracheotomy could be performed the patient nearly died of asphyxia. The day following operation, the edema disappeared completely, the tracheotomy tube was removed, and the patient has remained well since.

Slight reactions are commonly the result of surface contact, while the more severe ones, associated with edema, occur more commonly as part of a general reaction.

The condition can easily be mistaken for retropharyngeal abscess or perichondritis. The absence of local redness and the history usually serve to differentiate.

Bronchial Symptoms.—These include cough, bronchial obstruction with inspiratory and expiratory wheezing (due apparently both to edema of the membranes and to spasm of the bronchial muscles) and the expectoration of clear, watery or mucoid sputum rich in eosinophils and often containing Charcot-Leyden crystals. This reaction may vary in severity from slight cough and shortness of breath on exertion to obstruction so complete as to cause acute emphysema, spontaneous pneumothorax, and even a condition bordering on asphyxia. Patients may become comatose with the color of slate from asthma. Death from asphyxia, however, is rare in uncomplicated cases; in fact, the only cases of asthma which I have observed that terminated fatally were complicated with bronchopneumonia or other illnesses.

Bronchial symptoms are probably as often due to surface contact with offending substances as to agents distributed by the blood stream. Contact reactions are frequently associated with reactions in the orbit, nose or pharynx, whereas asthma as a general symptom is usually associated with hives, angioneurotic edema or other general manifestations. Asthma may occur, however, as an almost isolated symptom.

The symptoms and the course of asthma are so varied that many pages would be required even to approach a complete story. Little would be gained by such a description. Suffice it to say that the symptomatology of asthma is as varied as the symptomatology of urticaria. The variation in both instances, however, is not a matter of accident but a matter of law, the symptoms appearing whenever the conditions which produce them are met with, and disappearing when such conditions are avoided. Cases of asthma of long standing are usually complicated by anatomic changes in the mucous membrane and musculature of the bronchi, in the mucous glands, in the lung parenchyma and even in the shape of the chest itself. Furthermore, in cases of long standing, infection, both in the mucous membrane of the tubes and in parenchyma of the lung itself, complicates the situation so that chest symptoms often persist even after the agent primarily responsible for the disorder, "asthma," is eliminated.

The seasonal attacks and short periodic attacks are of little consequence compared with the perennial cases in which symptoms persist for weeks, months or years. In periodic cases, the pulmonary tissues apparently have a chance to regain their normal status between attacks. Patients in whom the symptoms are inclined to be continuous fare much worse. The most serious cases are apparently those which occur in the winter, and of these many are sensitive to heat. The patients are predisposed to influenza, suffer severe exacerbations following such attacks, and frequently end up with apparent bronchopneumonia. Frequently, patients of this kind have as many as three or four attacks of "pneumonia" each winter.

Nothing is simpler than the diagnosis of asthma in a well marked case. The finding of musical râles through the chest with negative roentgen-ray findings, combined with a positive family and personal history, leaves little chance for error. However, mild cases, in which the symptoms may simply be cough and shortness of breath on exertion, are often difficult to diagnose and are frequently misdiagnosed tuberculosis, emphysema, chronic bronchitis, or bronchiectasis. They are often believed to occur as a result of a nasal defect, chronic nasal sinus infection, heart disease, kidney disease or enlarged thymus. Many conditions of cough complicating the latter illnesses are, in reality, true bronchial asthma.

There are few diseases more disagreeable than chronic asthma. It frequently results in real organic pathologic conditions, such as chronic bronchitis, emphysema, fixed chest and, in severe cases, emaciation. It rarely terminates in bronchiectasis, however, except when complicated by other conditions.

In treating asthma, it is essential to treat not only this condition but also the complications and sequelae. It is all important to get rid of the

cause, if possible, and in addition to this, to use every means at our disposal to keep the patients free of symptoms. As a general rule, the longer the patient stays free of symptoms, the easier are the recurrences to treat. This will be discussed at length subsequently.

Cutaneous Symptoms.—Cutaneous symptoms, like nasal and bronchial symptoms, may be acute or chronic, seasonal or perennial, in character. This depends on the nature of substance to which the skin is sensitive. The symptoms, pruritus, erythema and edema, may occur together or singly, and may be associated with the exudation of sebaceous or watery secretion. Marked thickening of the skin is common in the more chronic cases and may be associated with desquamation and cracking of the skin. Skin reactions may be mild and may consist of a simple slight pruritus and erythema; or may be most severe, and when the skin of the face is involved, may almost obliterate the features and transform it into a swollen, red, greasy, weeping, unsightly surface. Itching may be almost intolerable, and secretion may drench the hair and clothes in severe cases.

Dermatitis may occur as a result of contact with the air-borne substances or may occur as a part of a general reaction. Dermatitis confined to the face, neck, hands and, to lesser degree, the ankles (that is, to the exposed parts) is almost always a result of surface contact, whereas generalized dermatitis, and even dermatitis occurring in patches over the body generally, is more frequently the result of a general reaction. This statement is, of course, subject to exception. In three cases of wool sensitiveness, the reaction was quite general, because of the large areas of surface contact with woolen underwear.

Contact reactions of the skin are not common. One of the earliest cases reported was Sutton's, caused by ragweed pollen. Dermatitis frequently is traceable to sources of vegetable origin, other than pollen, just as in the case of nasal and bronchial reaction. Interesting reactions are those which are caused by formaldehyd and other chemical irritants, drugs of the cocain series, hair tonics, dyes, gasoline fumes, and smoke. These occasionally cause dermatitis, the source of which is difficult to discover unless the physician can visit and study the premises on which the patient lives.

Contact symptoms are frequently associated with nasal or bronchial reaction. Unfortunately, reactions are frequently delayed. This makes diagnosis difficult. Skin tests are frequently uncertain and, in the case of delayed reactions, may amount to little more than redness, which may be confined to the area directly exposed to the irritating agent.

Dermatitis which occurs as part of a general reaction may appear as erythema, pruritus, dermatitis urticaria or angioneurotic edema. The latter two conditions primarily are really not cutaneous but subcutaneous reactions.

Whereas the symptoms as mentioned have been emphasized, the fact that skin reactions may be either vesicular or papular must be mentioned. Furthermore, the fact that solitary reactions can occur and give rise to very confusing pictures must be emphasized.

Erythema, Pruritus, Urticaria and Angioneurotic Edema.—These four conditions, when they occur as a result of hypersensitiveness, seem fundamentally examples of one pathologic process. Erythema and pruritus are commonly associated together and would appear frequently to be a result of capillary dilatation. In many patients the usual reaction, erythema and pruritus, is associated with hives of varying size when the reaction is unusually severe. Hives, under certain conditions, may be associated with or alternate with angioneurotic edema. Transmutation, one to the other, may occur spontaneously or under the influence of therapy.

Urticarial lesions vary greatly in distribution, size and shape. They vary from small linear or pin-point lesions to large, irregular, elevated areas which may take on almost any conceivable shape. In the case of large reactions (giant urticaria), huge skin surfaces may be involved and give rise to marked deep swellings which are ordinarily classed angioneurotic edema. The size and shape of the hives are influenced, no doubt, largely by the tissue spaces and elasticity of the tissue layers in which they are located.

Angioneurotic edema may appear at any area of the skin surface and in the internal organs. When it causes obstruction to some important channel, such as the trachea or small intestine, very serious disturbances and even death may result.

The four symptoms above described present different clinical pictures, varying according to the cause of the illness. Reactions caused by the ingestion of a food which is rarely eaten are usually of short duration, but may be severe while they last. If due to an article commonly met with, the illness is chronic and may last for weeks or months, or even years.

Urticaria of the deep variety with angioneurotic edema is not often a reaction of surface contact. It occurs more frequently as a part of a general reaction. It occurs typically after the ingestion of foods to which a patient is sensitive, after the injection of therapeutic serums or of pollen extract and after insect bites in sensitive persons. The reaction may appear without apparent cause in chronic diseases, such as carcinoma, intestinal disorders and chronic interstitial nephritis, and as a complication of the acute infectious diseases, such as acute tonsillitis and rheumatic fever. On the basis of the work of Eustis and Koessler, one can easily believe that it occurs frequently as the result of the absorption

of histamin-like bodies from the intestinal tract and, in this case, might involve normal persons, as well as individuals of allergic strain.

In this connection, one must emphasize the importance of physical agents, to be described subsequently, as a cause of reaction of this type—not only of erythema, pruritus and urticaria, but also of angioneurotic edema. In a number of cases studied, urticarial lesions could be traced specifically to the effect of a physical agent, such as light, heat or cold.

It is necessary, furthermore, to mention the importance of solitary reactions which were occasionally observed, and which may appear as wheals or papules under the influence of agents whose effect is too mild to provoke widespread general reaction.

Headache.—Headache may occur as a primary symptom of reaction, or may be the result of a pressure in the nasal sinuses caused by swelling of the nasal membranes. The latter type could hardly be called a primary allergic headache.

Headache due primarily to allergy is not a common symptom but makes up in severity for its rarity. It may be so severe as to cause the patient to cry out in agony in spite of the use of relatively large doses of morphin. It is not exceeded in its severity by the headache of brain tumor, acute sinus infection or migraine. Practically always, headache is a general symptom, and for this reason is usually associated with reaction in other localities.

In one patient it was associated with an outpouring of watery nasal secretion, itching about the neck and profuse secretion of sweat from the scalp. After several attacks which could be cut short by epinephrin, these symptoms disappeared and were followed by chronic asthma.

Headache of this sort is prone to accompany the reactions which immediately follow the use of arsphenamin or pollen extracts, or blood transfusion. It is often associated with pain in the lower part of the spine which evidently has the same pathogenesis, and which may be equally severe. Recovery has been complete in every patient that I have observed.

Headache of this source can easily be mistaken for migraine or headache of other sources. It can usually be differentiated, however, by the history and other manifestations so characteristic of allergic reactions.

Dizziness and Ménière's Syndrome.—Dizziness rather frequently accompanies other general manifestations of allergy; in fact, allergy seems to be a relatively common cause of dizziness.

In two cases, the patients were subjected to attacks of dizziness associated with tinnitus, nausea and vomiting, which would cause them to fall helpless to the ground. The slightest movement made by themselves or others during one of these attacks would make the symptom

much more severe, and would initiate, usually, an attack of vomiting. Each patient was afraid to venture out of the house for fear of injury.

Miscellaneous Symptoms: Gastro-Intestinal, Urologic, Neurologic, Joint and Circulatory Symptoms.—In a paper of this scope, it seems needless to describe in detail the many other symptoms which can occur as a result of reaction, but which do not interest the otolaryngologist particularly. A description of these is given in the articles mentioned in the bibliography.

Symptoms of reaction may apparently involve almost every tissue and almost every organ, and give rise to disorder. The more interesting of these are the gastro-intestinal attacks which may be very violent and simulate organic and functional disease due to other causes. The neurologic symptoms are interesting. The most common is a feeling of weakness and prostration. Occasionally, convulsions, migratory paralysis, paresthesia and anesthesia are observed. Mental disturbance is occasionally observed. Urologic manifestations are uncommon, but very definite, and may be very violent. The commoner manifestations are those of irritable bladder, occasionally associated with pain in the kidney region, which can simulate colic caused by stone. Hypotension and hypertension are commonly observed in general cases. Disturbances in menstruation, and joint symptoms resembling acute or chronic arthritis, are uncommon but very definite manifestations of reaction.

DIAGNOSIS

The diagnosis of allergy is relatively easy in the great majority of cases. It is easily possible to trace out the source of the illness in a majority of cases. In the minority of cases, it is difficult, and frequently the physician's ingenuity is taxed to the utmost. For the diagnosis of obscure cases, the following sources of information are useful: family history, personal history, physical, laboratory and roentgen-ray examinations, careful observations made by the patient, the effect of epinephrin on symptoms and specific tests (cutaneous, intracutaneous, ophthalmic, nasal, subcutaneous and clinical).

Although these measures often give a clue concerning the source of an illness, a diagnosis can rarely be proved by any of them. Proof depends on obtaining relief of symptoms by removal of the suspected cause, and finally, on reproducing symptoms during a well period, by bringing the patient again in contact with the suspected substance, in a more or less natural way. Surprising as it may seem, it is certainly true that even when these two fundamental requisites are complied with, an error in diagnosis is possible, though improbable. The reader can possibly be convinced of this by my citing a case of tabes dorsalis in a patient who was sensitive to apples and peaches, in whom lightning pains

could be induced by the eating of these fruits. Also, there was a patient (with urticaria calorica) who reacted to the effect of physical exercise. The source of the trouble was actually traced, not directly to the effect of exercise, but to the small amount of heat generated by exercise.

Family History.—Specific hypersensitiveness is one of the most consistently hereditary of diseases. In outspoken cases, a positive history of the condition in one or both parents can be elicited in almost 50 per cent. of the cases. A positive family history, therefore, is very important presumptive evidence in diagnosis.

Personal History.—A number of symptoms are characteristic of hypersensitiveness. Worthy of special mention are the ocular, the nasal, the pharyngeal, the bronchial and the cutaneous. Much less characteristic are the gastro-intestinal symptoms, the bladder symptoms, headache, nervousness, asthenia, hypotension and the like. The foregoing symptoms always suggest the possibility of reaction, especially when they occur in the absence of other apparent adequate cause for an illness, and when the family history is positive.

Physical Examination.—The more important signs of allergy which can be found on physical examination are the ocular, the nasal, the bronchial and the cutaneous. Cutaneous symptoms can occasionally be brought out by scratching the skin. This occasionally gives rise to the immediate appearance of typical wheals. Examination is also important in excluding sources other than reaction for a given complaint.

Observations by the Patient.—Practical observation by both physician and patient is important. It is often advisable, in an obscure case, to school the patient thoroughly in the mechanism of hypersensitiveness, so that his observations may be directed along useful channels. He should observe whether or not the origin or relief of symptoms bears any relationship to season, time of day, geographic situation, local environment, the proximity of animals or fowl, the eating of a food, the use of cosmetics, wearing apparel, odors, habits, and finally the effect of light, heat, cold, mechanical irritants, and physical or mental effort. Important information can often be gained through careful observation by the patient, which makes a correct diagnosis possible.

Specific Clinical Tests.—Useful crude clinical tests can often be made by having a patient eat a suspected food, or inhale a suspected vapor, the odor of a suspected perfume or the emanations from fur, feathers, animals, etc., or by the application of suspected substances to the skin. Such tests often make a correct diagnosis possible in the simplest sort of way, and are also very dependable when positive results are obtained. Frequently, however, this method of testing presents difficulties. In a person who is sensitive to several articles of food, such as milk, eggs and

certain vegetables, the greatest persistence in eating or in avoiding certain foods may fail utterly to give the diagnosis. This is especially true when reactions are delayed.

Skin Tests.—Two methods of making skin tests are used at the present time, the cutaneous or scratch method, advocated particularly by Walker, Pinness, Rowe and others, and the intracutaneous, advocated especially by Cooke. Both have a sphere of usefulness. The intracutaneous, the more delicate method, gives a greater number of positive reactions than the cutaneous, but has the disadvantage of giving a greater number of false positive reactions, or, rather, giving a greater number of positive reactions in patients who are not clinically sensitive. This is no handicap, if the the results are taken for what they are worth and what they actually indicate, and are used only in conjunction with information gained by history, physical examination and special tests. In this case, they are useful, and need not lead to serious error. The cutaneous reactions (or scratch tests) have their greatest sphere of usefulness in the testing of children (who react better than adults), and of patients sensitive to pollen and other air-carried substances. Patients of these types respond readily, as a rule, to cutaneous tests. Scratch tests are useful also for testing patients who are sensitive to agents such as turpentine, benzol and other substances which might prove irritating or harmful if injected intracutaneously. Cutaneous tests often fail utterly in elderly persons, and in patients whose symptoms occur as a result of a general reaction (as in food cases). In these, intracutaneous tests often give more marked and convincing reactions.

In my experience, both the cutaneous and the intracutaneous methods are useful, and neither should be used to the exclusion of the other.

It is needless, at this point, to describe in detail methods for making skin tests. It would not be possible in such a limited space to describe them in sufficient detail to be useful to the reader; for this information the many articles mentioned in the bibliography may be consulted.

Interpretation of Skin Tests.—Care should be taken in the interpretation of skin reactions. Otherwise, they are likely to be seriously misleading. The fault lies, however, not in the defects in the method itself, but in the way in which the information is used. The fact that a patient reacts cutaneously to a given agent does not indicate by any means that he is made ill by it as encountered under natural conditions. Furthermore, patients who are made ill by a given agent do not necessarily react cutaneously to it. Given these two facts, the following general statements may be made.

1. When skin tests give large hive reactions with pseudopods, it can be assumed that the patient is of allergic strain and probably hypersensitive to some material substance.

2. Occasionally, the skin reacts to one substance only. This is rare. When this is the case, the real offender often is discovered.

3. The skin in sensitive cases usually reacts to a large number of substances, and often to several groups of substances. When this is the case, the larger wheals usually indicate the greater offenders. This is the rule but is by no means invariable. A patient may react markedly to vegetables and slightly to grains, and be made actually ill by a grain only. The fact that extracts prepared for cutaneous testing contain a large variety of chemical bodies may account for this circumstance. The agent responsible for an illness may be the largest constituent of the mixture or the smallest constituent. If the offending substance is the smallest constituent, the skin reaction may be less marked than that produced by a mixture containing a less offensive agent in larger amount.

Although the foregoing facts may be disturbing to those enthusiastic over the possibilities offered by cutaneous tests, they are less disturbing than error; and if one bears in mind the fact that positive skin tests do not indicate sensitiveness to an agent as it is encountered in nature, one can often gain many useful clues without being seriously misled. A clue gained from a skin test should never be looked on as diagnostic, but should be used as a clue only. The diagnosis should be verified by, and based on, history and examination, and on other tests to be mentioned subsequently.

Ophthalmic and Nasal Tests.—The ophthalmic and nasal tests are especially useful in picking out pollens or other air-carried substances responsible for hay-fever and asthma. These tests should be made only after the results of skin testing have been observed. The ophthalmic test can be made by spraying pollen solution (1 : 1,000 or 1 : 100 extract from dry pollen) into the conjunctival sac. A positive reaction is indicated by redness of the conjunctiva and increased lacrimal secretion which persists for more than five minutes. Momentary redness cannot be considered positive. The effect of a positive reaction may be immediately relieved by instilling a drop of epinephrin (1 : 1,000 solution) in the conjunctival sac.

The nasal test is made by spraying a pollen solution (1 : 1,000 or 1 : 100 solution) into the nose. A positive reaction is indicated by sneezing, swelling of the nasal mucous membrane and watery or clear mucous secretion which persists for several minutes or more. The ill effect of this reaction can also be relieved by the local use of epinephrin.

These tests are especially useful in pollen cases, and with their aid one can often pick out from a group of pollens which give positive cutaneous tests the one particular pollen responsible for clinical symptoms.

Inhalation Tests.—Nasal tests are also useful for testing in a simple way for sensitiveness to animal hair, feathers or emanations from vegetable matter. The test can often be made by having the patient inhale from the substance to be tested and noting whether or not it causes sneezing or other symptoms resembling hay-fever or asthma.

Subcutaneous Tests.—Subcutaneous tests have their greatest sphere of usefulness in confirming a given diagnosis. Their use is rarely necessary, however. If one suspects *Ambrosia elatior* as a cause of hay-fever, and can inject a small quantity of *Ambrosia elatior* pollen extract subcutaneously during a well period and reproduce the symptoms of hay-fever, he should feel that this pollen is the probable cause of illness. Reactions of this sort are frequently obtained during specific treatment with pollen and tend to verify a diagnosis.

In order to prevent severe constitutional reactions, subcutaneous tests should be used with great care, if at all, and only minute amounts should be injected.

Clinical Proof of Diagnosis.—Whereas the preceding tests may give useful clues, they do not prove a diagnosis. Proof, such as it is, lies finally in clinical tests. If the offending agent has been discovered, the patient should be relieved by its removal, and symptoms should recur during a well period when he is again brought in contact with the suspected substance in a natural way. This is not proof, but is the best that can be obtained by practical methods of testing at our disposal at the present time.

SPECIFIC, NONSPECIFIC AND SYMPTOMATIC TREATMENT

Illnesses caused by hypersensitiveness to foreign substances can be treated along five different lines; namely, avoidance or removal of the specific cause of illness; avoidance or removal of contributory causes; specific protein treatment; nonspecific protein treatment, and symptomatic treatment.

Each of these methods is important. The choice depends on the severity of the illness, the degree of hypersensitiveness of the patient and the nature of the substance to which the patient is hypersensitive. In the majority of cases, two or more of the foregoing measures can be used to advantage.

The simplest method is best when the simplest can be used; namely, the avoidance or removal of the specific cause of illness. However, removal of the specific cause is often difficult or almost impossible. This is often true in the case of sensitiveness to the common pollens, to wool, to common foodstuffs (such as cooked milk, eggs, sugar and wheat), to miscellaneous substances which occupation often brings a

patient in contact with and to substances which cannot be discovered by means at our disposal. In these instances, one or more of the latter four measures must be chosen.

Avoidance of Cause.—Avoidance of cause is often simple, if one knows the nature and whereabouts of the substance responsible for reaction. It is difficult if its distribution is only partly known. For example, a patient who was sensitive to whole egg, cooked or raw, continued to have symptoms occasionally after egg was apparently removed from the diet. It was eventually found that she was sensitive to hen meat, but could easily tolerate rooster meat. The occasional attacks which occurred while she was on an egg-free diet were traced to the egg in hen meat. It is not uncommon for patients sensitive to products of vegetable life to react to the traces of such substances contained in milk, and for buckwheat cases to react to the traces contained in honey. Avoidance of cause is difficult, therefore, unless the distribution of the agent causing the reaction is known.

Pollen.—Pollen can usually be avoided by a change in geographic situation. In the case of sensitiveness to light air-carried pollen of the common weeds which pollenate over a long season, complete avoidance can hardly be accomplished otherwise. Pollen can be avoided in sufficient degree to give relief in mild cases by removal of the common weeds of the neighborhood, by having the patient confine his activities to downtown districts, by avoidance of trips into the country, by having him live and work on the upper floors of office buildings or hotels and by having him keep the windows closed. This often gives partial or complete relief in mild cases, except on windy days when the air is filled with pollen even at the top of high buildings. Sheppegrell's ingenious experiments have shown the marked effect of air currents on the distribution of pollen in the air at different heights. On windy days he found pollen almost as abundant at a height of 5,000 feet or more as it was within a short distance of the ground. This, however, would not apply to an environment near a ragweed patch.

In the case of sensitiveness to rare pollens, such as coreopsis, relief can easily be obtained by avoidance of districts in which the flowers grow profusely, or by having them removed from the immediate vicinity.

Products of Vegetation Other than Pollen.—Products of vegetation other than pollen can usually be avoided easily if the source of the illness is recognized. Orris root is worthy of especial mention since this product is so widely used in the manufacture of perfumes, flavoring extracts and toilet articles of all sorts, including tooth paste, face powder, face cream and soap.

In the case of sensitiveness to the stalk or leaf of plants, such as clover or straw, the offending substance, as a rule, can be avoided sufficiently to relieve symptoms, if the patient is aware of the source of his trouble. Clover, on account of its profuse growth, is difficult to avoid entirely; but, according to my experience, the degree of sensitiveness is not extreme in grade, so that its complete avoidance is not necessary.

The essential oils and other products of plant life, such as turpentine, cedar oil and the oils used in perfumes and flavoring extracts, also the products derived from coal, such as benzol, and those derived from crude oil, such as gasoline, can usually be avoided easily if recognized as a source of illness.

Food.—The symptoms of food idiosyncrasy usually occur as part of a general reaction to a food or a split product. In the case of sensitiveness to uncommon articles of diet, such as tomato, onion and cabbage, avoidance is simple. When a patient is sensitive to articles used so commonly in cooking, as milk, eggs, wheat or sugar, avoidance is difficult, especially if he is sensitive to the cooked as well as to the raw product. It is rarely advisable to attempt specific treatment in food cases, except when the patient is sensitive to foods so commonly encountered as cooked milk, egg, wheat or sugar.

Animal Products.—It is rarely advisable to treat specifically for sensitiveness to animal dander, such as horse, cat or dog dander, since the animals and their pelts can usually be avoided. Specific treatment would seem justified only in the case of wool sensitiveness and in cases in which occupation necessarily brings the patient into contact with animals to which he reacts. In several cases of sensitiveness to wool (all eczemas), the symptoms were not severe and were relieved through the use of cotton clothing between the skin and woolen garments.

Walker has obtained good results in increasing tolerance for animal dander, by subcutaneous inoculations with dander extracts. He does not recommend this treatment, however, when avoidance is possible.

In sensitiveness to feathers, such as goose, duck or chicken feathers, relief can be obtained by the use of floss pillows.

Drugs.—When persons are sensitive to drugs, such as iodoform, formaldehyd, procain, morphin and acetyl salicylic acid, relief of symptoms can be obtained if the cause is discovered. One is occasionally sensitive to an impurity in a drug. This is important in the case of drugs so useful as acetylsalicylic acid and arsphenamin, and local anesthetics for a person sensitive to one preparation of a drug can often tolerate other preparations.

House Dust.—House dust is worthy of special mention, since it is frequently responsible for house asthma, the importance of which has

been especially emphasized by Cooke. Relief in this case can often be obtained by the removal from the house of certain articles of furniture, upholstery, rugs, disinfectants, cleaning fluids, glue, etc.

Smoke.—Persons sensitive to smoke can frequently obtain relief by a slight change in environment. One patient who had asthma, due apparently to gasoline smoke, could invariably obtain relief by moving to a different part of the hotel in which he lived. The room which he occupied at the time of his illness was situated directly over the garage. Persons sensitive to coal smoke should be cautioned against long railroad trips, since in this position they are frequently exposed intensely to smoke, and may suffer a severe exacerbation of their illness. In one patient sensitive to smoke, a long trip precipitated an attack which nearly terminated fatally.

In a case of sensitiveness traced to wood smoke, it was found that the patient could live comfortably in steam heated apartments, but that she invariably had severe asthma in houses in which open fires or furnaces were used. She was so affected even during the summer months when the furnaces were not in use.

Bacteria.—Definite symptoms of reaction often accompany acute infectious diseases, such as rheumatic fever and scarlet fever. These manifestations can be treated best symptomatically, since they usually disappear spontaneously after the acute illness has subsided. Persons sensitive to products elaborated in chronic foci of infection should be treated by the removal of such foci. This type of illness, studied especially by Walker, seems to be rare. When the focus cannot be reached, treatment with vaccines might be justifiable. According to both Walker and Rackemann, this method of treatment frequently yields beneficial results. However, one would think in the case of sensitiveness of this sort that the patient would gain tolerance through constant intimate contact with the products of infection elaborated within his own body.

Therapeutic Serums.—In demonstrated hypersensitiveness to horse serum, the therapeutic use of this serum is dangerous even in small doses, and should not be used unless the indications are urgent.

Multiple Sensitization.—Patients sensitive to a number of substances may tolerate some of them, if the others are carefully avoided. For example, many patients with pollen hay-fever give positive skin tests to vegetables, fruits or grains, and actually obtain partial relief of hay-fever by avoidance of the food products to which they give positive tests. Such substances may have no untoward effect except during the pollen season. One patient with hay-fever and eczema was found sensitive, among other things, to a certain silk dress. An extract from the dress

gave an intensely positive cutaneous test. It was observed, however, that when her illness was relatively mild, because of the avoidance of other substances which made her ill, she could wear the silk dress with impunity. At other times, however, when she was suffering markedly with hay-fever and dermatitis, contact with the dress invariably caused itching and an increase in the rash and asthma.

Removal of Contributory Causes of Reaction.—Frequently it is impossible to discover the specific substance primarily responsible for reaction. In this case, removal of certain contributory causes may relieve the patient partly or completely.

Physical Factors.—Physical factors, such as light, heat, cold, mechanical and chemical irritants and functional activity, frequently influence the symptoms of reaction, and often determine their site of localization. The untoward effect of physical factors has been mentioned by many observers and is noticed by a large proportion of sensitive patients. For example, patients subject to urticaria are frequently relieved to a marked extent by the removal of agents which irritate the skin mechanically; by the avoidance of agents which cause increased activity of the glands (sweating); by protection of the skin from heat or cold, and by the avoidance of irritating lotions.

Similarly, patients who have dyspepsia and abdominal pain, as a result of alimentary reaction, can often obtain partial relief by the avoidance of foods, such as nuts, which irritate mechanically; by the avoidance of substances, such as coffee, salt, and alcohol, which stimulate functional activity; by the avoidance of condiments, such as mustard and pepper, which irritate chemically.

Likewise, patients who have asthma are often relieved to a marked extent by the avoidance of dust and irritating vapors, and exposure to heat or cold.

Whereas physical factors no doubt add in a purely physical way to symptoms caused by sensitiveness to other agents, this should not give rise to doubt as to the existence of specific hypersensitiveness to the action of physical agents to be discussed subsequently. I am by no means certain that the facts before cited are not in reality traceable to the effect of combined sensitiveness.

Pathologic Factors.—Patients who are ill with symptoms of reaction (especially general reaction) may be made better or worse by additional illnesses. Occasionally, they are relieved completely by another disease. I have observed a number of patients with chronic perennial asthma who apparently were permanently relieved by severe infectious diseases, erysipelas in three cases and scarlet fever in one. I have frequently observed complete temporary relief during the course of an acute infectious disease, even during an attack of pneumonia. This may be

accounted for possibly on the basis of heat sensitiveness. For example, a patient with chronic urticaria caused by heat sensitiveness was temporarily relieved during the febrile period of an infectious disease. Relief could be attributed in this case directly to fever, since the patient reacted to heat only when the temperature was subnormal.

Frequently, chronic asthma or urticaria starts soon after an operation. This is such a common experience that surgeons should hesitate to operate on patients of allergic strain. Occasionally, the reverse is the case; that is, relief follows an operation. Walker mentions a case of asthma relieved by a hernia operation. In one of my cases, chronic urticaria was relieved by a hemorrhoid operation. Alimentary reactions are usually made worse by ulcer, gallbladder disease or chronic appendicitis. Often partial or complete relief can be obtained by the treatment of these conditions.

Dysfunction in the glands of internal secretion, which is rather frequently noticed in cases of general reaction, often adds to the severity of the illness, and treatment of the conditions occasionally gives partial relief.

Specific Protein Treatment.—In view of the knowledge of the tolerance which can be developed in patients or animals for living bacteria by subcutaneous inoculation with their products, and in view of the fact that hypersensitiveness to serum in animals can be completely removed by inoculations with serum, it has been quite natural that many investigators working both jointly and independently should have tried this method of treatment on human beings sensitive to pollen and other bodies not of bacterial origin.

It is good fortune that tolerance for foreign substances can frequently be developed in this way in sensitive patients, and it is surprising that statistics published by different writers using different plans in therapy agree in the essentials concerning the results which can be obtained. Many names and researches responsible for the development of this line of knowledge may be found in the bibliography.

Pollen Treatment.—The practical development of this line is a result of the effort of many investigators, among the earlier of whom may be mentioned Curtis, Dunbar, Noon and Freeman, Koessler, Lowdermilk, Rackemann, Walker, Cooke, Scheppegrell and Goodale.

Specific Therapy with Pollen.—Two months ago, I should have described in elaborate detail the technic for administering pollen extract, with a detailed discussion of preseasonal and coseasonal treatment, and long interval and short interval methods. In fact, in my monograph these methods are described in painful detail. During a recent visit from E. W. Phillips of Phoenix, Ariz., a point in technic was demonstrated

to me which shortens, simplifies and makes pollen treatment more effective, so that I would refer the reader to his article (which may appear soon) for details of his method.

A brief description of a good method may not be out of place, however, at this point, even though it is not as effective as Phillips'. To obtain good results with pollen by any method, it is first necessary to be sure of the potency and nature of the pollen solutions which are to be used. It is desirable at the beginning of a season to make up enough extract to last for an entire season, for extracts vary in their potency and with age lose potency, so that a new preparation might be many times stronger than an old one and might cause severe reaction if used in the same dosage as the older extract.

Considerable difference of opinion exists concerning the time at which treatment should be commenced. Walker, Cooke, Rackemann and others start a considerable period of time before the beginning of the season, when this is possible. Bernton writes concerning the value of coseasonal treatment. By giving pollen at short intervals (from several hours to one day) and increasing the dose rapidly, I have been able in the majority of cases to get tolerance in almost every patient within a period of from two to three weeks or less, and through the use of Phillips' suggestion, have been able to rid patients of their symptoms who come during the season within a period of from several hours to several days.

The following short interval method can be recommended for the average case: For an initial dose of pollen extract, about 0.1 c.c. or less of a solution corresponding to 0.01 mg. by weight of the dry substance to each cubic centimeter of solution should be given subcutaneously. The injections can usually be given twice daily in the beginning of treatment, and the dose can usually be doubled at each inoculation until the stronger dilutions are reached; namely, solutions containing about 1 mg. to the cubic centimeter. At this time, it is often necessary to space out the time interval to daily injections or to injections of longer intervals. This varies with the patient. When a dose of from 0.25 to 1 c.c. of a 1 to 5 per cent. solution is reached, the time interval can be spaced out to three or four days or longer, and this can be continued until within six weeks of the end of the season when treatment can be discontinued. The final dose necessary for the relief varies with the district, the season, the pollen to which the patient reacts and the degree of sensitiveness of the patient. This technic can be used either preseasonally or coseasonally, and gives practical relief in almost 100 per cent. of the cases which are not complicated by sensitiveness to other agents, including physical agents.

The foregoing plan is safe in the hands of physicians who are experienced in pollen therapy, in fact, is much safer, I am sure, than

routine skin tests and also than the long interval methods which I employed previously. My reactions have not been obtained with high doses of pollen given according to any method, nor have they occurred in patients in whom the plans were carried out according to rule. Reactions have occurred usually with the smaller doses and in patients who have not taken treatment regularly. Patients who stop treatment for two weeks or more are likely to react strongly when therapy is resumed, unless the dose of pollen is greatly reduced.

Patients who have a tendency to have hay-fever can be advised to wear goggles at times, even at night, especially when they are exposed to pollen on windy days; to avoid pollen as far as possible by keeping in downtown districts, keeping the windows closed, avoiding trips into the country and railroad trips, and, when needed, to apply to their conjunctivae and nasal mucous membrane a lotion consisting of: epinephrin 1:1,000 solution, 1 c.c.; dilute acetic acid, 0.3 c.c.; resorcin solution, 2 per cent., sufficient to make 32 c.c.

This advice is rarely necessary for patients who have been thoroughly treated. The fact, however, that such advice is useful to patients who have not been treated thoroughly is very evident to physicians who have had experience in this line of work. For example, two patients, a brother and sister, were treated simultaneously for pollen hay-fever. Each received the same treatment precisely. They resided in a house surrounded by ragweed patches. The brother was downtown the greater part of the day, and the sister was at home. The sister had hay-fever and the brother remained absolutely free from it.

Intranasal Treatments.—Local treatment of the mucous membrane of the nose and eyes, suggested by McKenzie, is practical and useful. It should be used when subcutaneous treatment for one reason or another fails or has been given for too short a period to give relief during the pollen season. The treatment solutions in 1:1,000 or 1:20 dilution can be sprayed into each nostril and into each eye. Following this there is, of course, almost invariably a marked attack of hay-fever. This can be controlled by the local use of epinephrin. If such injections are made at daily intervals, the severity of the reaction decreases rapidly, and usually after three or four treatments little reaction occurs at all. At this time, the symptoms of hay-fever becomes markedly reduced or disappear completely.

Theoretical Basis for the Short Interval Method of Treatment.—On first thought, one is likely to believe that pollen therapy is analogous to desensitization in the case of serum sensitiveness in animals. Unfortunately, this is not the case. According to Besredka's method, an animal sensitized to horse serum can be desensitized quickly by the giving intravenously of infinitesimal doses of horse serum, increased and

repeated at intervals of a few minutes until a large dose is reached. In animals, complete desensitization can be effected within a period of an hour or so. In human beings, however, sensitiveness to foreign agents is many times greater than that ordinarily observed in animals. Furthermore, it is much more difficult to desensitize a human being, and an effort to desensitize rapidly is dangerous. For this reason, Besredka's method should not be used in the treatment of human beings. A case has been reported recently in which severe reactions and death followed the intravenous use of pollen.

On first thought one might believe that pollen therapy is analogous to vaccine therapy. One might be inclined, therefore, to follow methods learned from the much used vaccine therapy or tuberculin therapy. Here, again, lies an error. Pollen therapy and vaccine therapy are quite different. The reaction from a vaccine injection appears slowly; that is, after a period of hours or a day. Furthermore, the period of immunity from an injection lasts longer—for a number of days. A reaction in a pollen case is different from this in that it appears quickly (within a matter of minutes) and disappears more quickly (within less than one hour, as a rule), and finally, in that the immunity which follows does not last so long. For this reason, one should expect theoretically that the optimum method for giving pollen injections would be at short intervals, instead of at the long intervals (from three to five days) used in tuberculin therapy. In this way I account for the frequent reactions which I have had during my use of long interval methods employed in previous years. Not only were constitutional reactions more frequent, but also local reactions on the arms were much larger. After the use of an infinitesimal dose of pollen, the tendency to react occurs quickly and is over quickly, and the immunity derived from it is probably at a maximum within a period of hours. Therefore, the optimum time to increase the dose of pollen and repeat it should be within a period of hours, that is, on the same or following day. As larger doses are reached, the time interval can be extended, and when large doses are administered, the interval can be extended to a period of several days.

Precautions Suggested for the Avoidance of Reaction.—If the following precautions are used, reactions should be few and far between, and mild.

1. Before pollen solution is injected, the piston of the syringe should be withdrawn strongly, and in case blood enters the syringe, it should be withdrawn and reinserted. Many of the intense reactions are caused by the injection of pollen solution into a venule or capillary.

2. Patients should be kept in the office after treatment for one half hour, or preferably more; and in case symptoms of reaction, such as

sneezing, itching of the eyes, wheezing or itching of the skin, are noticed, 1 c.c. of epinephrin should be administered subcutaneously immediately.

3. The dose should be increased with regularity. It should be doubled at each inoculation if the patient tolerates it. In case he does not tolerate so rapid an increase, the rate of increase should be reduced to a 75, 50 or 25 per cent. increase.

4. The time interval should be regular, and in patients who have discontinued treatment for a week or more, the dose should be greatly reduced; in fact, it is almost safer to start treatment again.

5. A dose of pollen extract should never be repeated unless the local effect of the previous dose has almost entirely disappeared.

6. A dose should not be increased if the previous one gave rise to slight constitutional reaction. In this case, the dose should be either repeated or reduced.

7. One must be certain of the potency of the solutions used. If a solution is used which has lost its potency, and later a fresh, potent solution is substituted, the dose of potent extract may be enormously increased without the physician's knowledge, and a severe reaction may ensue. For this reason, a sufficient quantity of concentrated pollen extract should be made up at the beginning of the season to last the entire season. Serial dilutions can be made from this as needed. If a fresh stock solution must be made during the season, the dose administered should be greatly reduced. It can be again increased rapidly, so that as a rule little time need be lost. A warning against the use of large doses of freshly made solutions cannot be urged too strongly. Unfortunately, the potency of a pollen solution is an unknown factor unless tested on a patient, and even then its potency is unknown except for the patient tested. Freshly made solutions should never be started in high dosage.

Results of Pollen Therapy.—No results are more irregular than those which follow pollen therapy, unless treatment is adequately and carefully administered. In this case, the results obtained almost follow mathematical laws. If a 0.1 per cent. solution of pollen extract is the maximum strength used, practical relief can be obtained in this district in only about 40 per cent. of the cases. If the solutions used have a maximum strength of 1 per cent., practical relief can be obtained in about 60 per cent. of the cases. A large proportion of the remainder, however, can be relieved with intranasal treatments. If about 0.5 c.c. of a 5 per cent. solution is used as a maximum dose, practical relief can be obtained in practically every case, and intranasal treatments are unnecessary. A failure to get relief should make one suspect an error in diagnosis.

It appears, on the whole, that patients with pollen disease are either easy to relieve or are difficult to relieve. Of the former group, pollen therapy according to almost any plan seems to give partial or complete relief. This includes about 40 per cent. of the cases. In the remainder, however, treatment has to be given adequately and thoroughly, if relief is to be obtained in a large proportion of the cases. It has seemed impossible to predict by history, duration of illness, or skin tests which cases will be easy to relieve and which will be difficult. Many causes of variance are, of course, attributable to the habits and environment of the patient. If habits or business bring him in the vicinity of large ragweed patches on windy days, he will, necessarily, be difficult to relieve.

Duration of Immunity.—The duration of immunity gained through pollen therapy varies. This variance is great in localities which are overgrown with weeds of many different varieties, and especially if the seasons are short. If a patient happens to be sensitive to a weed which is not common, freedom from symptoms under treatment should last longer than for patients sensitive to common weeds, to which they are intensely exposed.

One cannot rely on the duration of immunity lasting more than from six to eight weeks. However, it usually lasts much longer than this, and often relative immunity persists to the second or third season, or for years. Patients treated for several seasons seem to have a more lasting and better immunity clinically than patients treated for one season only.

Theoretic Basis for Pollen Therapy.—When animals sensitized to horse serum are desensitized by Besredka's method, sensitiveness eventually returns. Presumably, they are resensitized by the serum used in desensitizing. Is this the result obtained in pollen therapy? It does not seem to me that this is true. I have never observed a patient who, during the second, third or fourth season after treatment, was worse than formerly, unless the condition could be accounted for by an unusual amount of pollen in the air; in fact, they have seemed the reverse in practically every instance. After all, theoretical immunity and practical clinical immunity are two totally different things, so far as pollen sensitiveness is concerned; and although skin sensitiveness returns after a thorough course in pollen therapy, this does not coincide with a return of clinical sensitiveness to the pollen as encountered naturally. Clinical sensitiveness may not return for months or years, so that in a certain smaller proportion of cases, such as in Lowdermilk's personal experience, the cure seems permanent.

The theoretic basis for pollen treatment seems to amount practically to the following:

Patients do not ordinarily react clinically to substances with which they come frequently into gross intimate contact. They react rather to substances which they meet rarely or meet in traces. In pollen treatment, we change this mode of contact from "occasional traces" to relatively gross intimate contact, and this, I believe, gives our clinical result. Skin sensitiveness may or may not return coincident with this; as a rule, it does not return at the same time but later. It seems that relief does not depend entirely on desensitization of the body tissues generally. This is no doubt a factor, but there seems to be in addition to this another factor which gives rise to clinical tolerance, even though tissue sensitiveness returns. I would not venture to suggest a theoretic reason for this apparent tolerance further than to say that it seems to be a result of intimate gross contact.

Specific Therapy with Proteins Other than Pollen.—Treatment of hypersensitiveness with protein other than pollen is not so satisfactory as that with pollen. It is possible in the majority of cases of sensitiveness to substances other than pollen for the patient to avoid the substance responsible for illness. For this reason, specific therapy is not so necessary.

The fact that treatment with such substances as egg and milk has not been as successful, on the whole, as therapy with pollen extract can be attributed possibly to the following circumstances. Patients who react to pollen are sensitive to the substance as encountered naturally by the patient and as it is used in therapy, while patients sensitive to a food may not be sensitive to the food as it is encountered naturally and as it is used in treatment, but may be sensitive to a totally different substance; namely, a digestive product or a new product formed during the process of cooking. In these cases, subcutaneous treatment with extracts as ordinarily prepared in a laboratory would seem theoretically illogical. Treatment by mouth with the food prepared in the way it is ordinarily eaten would seem to offer more hope of success. Whereas in occasional cases patients treated with milk or egg subcutaneously obtain relative tolerance, this result is not the rule.

It may be well to recapitulate and say that in treating for food sensitiveness, it is advisable to use a food in the form in which it makes the patient ill. In the case of sensitiveness to cooked egg, an extract of cooked egg should be used. If cake causes illness, it should be used in treatment, rather than raw or boiled egg.

On purely theoretic grounds it might be suggested that treatment in food cases should be continued indefinitely. For example, if tolerance

for egg by mouth is obtained, it would seem logical for the patient to try to keep up his tolerance by eating eggs each day for a period of months or years.

Nonspecific Protein Treatment.—In spite of one's like for the use of arbitrary remedies in the practice of medicine, it is in the present state of our knowledge advisable to use them at times. This may be said of nonspecific protein therapy in the treatment of allergy. Nonspecific protein therapy can occasionally be used with a fair temporary therapeutic result in the treatment of chronic asthma, chronic gastro-intestinal disturbances, eczema and other disorders (occurring as part of a general reaction), when no other more rational line of therapy presents itself. It is not recommended in the treatment of local reactions due to contact, such as hay-fever or asthma caused by sensitiveness to air-borne substances, as pollen or hair. In this type of case, the benefits, if any, do not justify the illness caused by the treatment. It is excusable, however, to try it in general cases, when the primary source of the disorder cannot be found or removed.

It is not necessary to discuss nonspecific protein therapy broadly in this connection. Suffice it to say that it has an influence on immunity and, under certain circumstances, has an influence on the functional activity of organs supplied by the vegetative nervous system.

Everything from typhoid bacilli to milk has been recommended in this type of therapy. I have chosen colon bacilli because patients are almost always sensitive to them, and it has seemed to be the reaction which does good. The colon bacillus injected intracutaneously almost always gives rise to a marked local inflammatory reaction (not a hive reaction) within twenty-four hours in normal persons. If injected subcutaneously or intravenously in small doses, it always gives a marked febrile reaction. As a rule, subcutaneous treatment is safer, less severe and preferable. If this fails, a smaller dose, roughly from one fifth to one tenth the subcutaneous dose, can be used intravenously.

In view of the fact that patients with asthma and urticaria caused by sensitiveness to heat frequently have markedly subnormal temperatures (94 to 97 F.), and react most violently when the temperature is lowest, we may well ask ourselves whether or not the effect of nonspecific protein therapy in asthma and urticaria is not frequently an indirect one, effecting a temporary cure largely through keeping body temperature at a higher level.

Symptomatic Treatment.—I do not wish to discuss at length the symptomatic treatment of allergy, except with drugs the effect of which seems relatively definite. The great majority of drugs which have been enthusiastically recommended by one physician or another as cures for a majority of cases have proved in my experience to be either ineffective

or variable in their effect. Possibly the results reported by different writers will be more harmonious when the different types of sensitiveness can be classified, and the effect of the various remedial agents on each type carefully studied. It is certainly a fact that the results obtained with a given drug by physicians treating chiefly pollen cases will vary grossly from those of physicians treating chiefly perennial cases. For this reason, the time is not opportune for the discussion of any agents except those which have a relatively consistent effect in certain types of cases.

Epinephrin.—This is the one remedy which is relatively consistent in its effect on all types of reaction. It is not only effective when applied locally, but also, as a rule, when given subcutaneously, if the dose is properly adjusted. Epinephrin appears to be effective in all types of cases when applied locally. It is effective in the great majority of cases when given subcutaneously, although in some types more than in others. It is less effective apparently in contact cases than in general cases; that is, less in pollen hay-fever occurring as a local reaction, than in asthma occurring as part of a general reaction.

If one wishes the greatest benefit from epinephrin, with its disagreeable effects reduced to a minimum, it must be administered in the smallest dose which has the desired clinical effect. This varies in different persons and in the same person at different times.

In chronic asthma, it is not uncommon to find that a patient can be relieved by 15 drops of epinephrin by mouth, or by 1 or 2 minims subcutaneously each twenty-four hours. The same person may require at other times several 1 c.c. doses during twenty-four hours, and epinephrin by mouth may be ineffective. I observed two patients who for months could keep themselves symptom free by the subcutaneous use of a few drops of epinephrin each day. During exacerbations in their illness, they would suddenly become tolerant of its effect and require as much as 4 ounces each twenty-four hours to obtain noteworthy relief. Whereas at times the effect of 2 minims would give practical relief and tremor, at other times 1 c.c. or 2 c.c. doses would give little relief, and this would often last not more than five minutes. Furthermore, during such intervals, epinephrin would fail to cause tremor. I cannot say that I approve of the use of enormous doses such as the foregoing, but the patients were treated under the care of other physicians who were fearful of losing their cases if epinephrin were not repeatedly used in the doses mentioned. Strange to say, 1 or 2 minims of epinephrin given subcutaneously will at times give pallor and slight epinephrin tremor, while at other times, when large doses are required for relief, pallor and tremor do not appear at all. During such periods of tolerance, it would seem advisable to

support the epinephrin treatment with some other form of therapy, and it is here, if ever, that the use of habit-forming drugs might be indicated temporarily. I have used morphin only twice in five years in the treatment of asthma, and chloroform only once. An emergency which demands these drugs is a rarity.

When a patient with asthma is first seen and epinephrin is to be used, it is a good rule to give 0.5 c.c. of a 1 : 1,000 solution subcutaneously at five minute intervals until relief is obtained, or until tremor appears. Relief, as a rule, follows the tremor. One can estimate with relative accuracy the size of the dose which will be required for recurrences. As a rule, when symptoms return, or better still if the attack can be anticipated by some sensation recognized by the patient, the dose can be reduced and, on subsequent recurrences, can be still further reduced. Frequently, when several cubic centimeters are required to stop an original attack, a few minims will suffice to prevent subsequent attacks. This is especially true if the patient learns to administer epinephrin himself, and anticipates attacks by a few moments. When this point is reached, 15 minims of epinephrin in a half glass of water, by mouth, will often accomplish as good a result as the smaller dose subcutaneously.

Epinephrin should be given slowly; in fact, if a 2 c.c. dose is required, several minutes should be used, if possible, in its administration. This has been especially urged by Kahn, who has been one of the strongest advocates of the free use of epinephrin in the treatment of asthma. It should be given intravenously only under desperate circumstances.

Epinephrin can be used evidently for weeks or months without apparent ill effect, although perhaps more experience is needed before the harmlessness of this drug can be relied on if used for indefinite periods of time. I have observed several patients in whom it has been used for months and years with no apparent ill effect. In one case, pigmented spots resembling large freckles became pronounced in several localities.

While epinephrin can apparently be used continuously for months without ill effect, it is best adapted for emergencies and for temporary treatment, and should be discontinued as soon as measures which have a more lasting effect can be instituted.

Pituitary Extract.—Applied locally, pituitary extract causes mucous membranes to blanch and shrink, just as epinephrin does. This effect is not quite so prompt, but it lasts longer. If given subcutaneously pituitary extract frequently has somewhat the same effect as epinephrin. As a rule, however, the result is less marked and less constant. If the drug is effective, it frequently gives a longer period of relief than epinephrin. In one case, epinephrin and pituitary extract together were

used to advantage. Koessler warns against the use of pituitary extract, on account of the frequency with which it contains histamin as an impurity.

Atropin.—Drugs of the atropin series are time honored remedies in the treatment of asthma. Meltzer suggested the use of atropin in the treatment of anaphylaxis. Atropin is effective in some cases even when given in small doses. In others it is ineffective. It can be used locally, subcutaneously or by inhalation. If given by mouth or subcutaneously it should be pushed to the point of causing dryness of the mouth. It is rarely advisable to push the drug to the point of blurring vision. Some patients can tolerate $\frac{1}{100}$ grain (0.0006 gm.) two or three times daily, while others who are more susceptible cannot tolerate this amount. Atropin can frequently be used to advantage in conjunction with epinephrin. Often the appropriate use of atropin in small doses marks the difference between success and failure in the relief of patients who have been treated according to other principles outlined. A patient nearly relieved by other means may often be completely relieved with the help of atropin.

Acids.—Dilute solutions of acid applied locally to the conjunctivae will frequently give symptomatic relief in ocular reactions, according to Dr. W. E. Schutz. He advises this as an aid in the treatment of ocular and nasal reaction. I have found the following prescription useful: Epinephrin, 1:1,000, 1 c.c.; dilute acetic acid, 0.3 c.c.; resorcin, 2 per cent., sufficient to make 32 c.c.; to be applied locally when needed.

Acid inhalations give temporary relief in a limited number of cases, as do acid applications to the skin in certain dermatoses. In treatment of the latter condition, soap should be avoided, and the acid used should be very dilute (15 drops of dilute acetic acid to a glass of water).

Acid by mouth is recommended in perennial cases, since a large proportion of the patients have subacidity or achylia.

Thyroid Extract.—Thyroid extract is beneficial in certain cases. It is apparently most useful in those patients who have dysthyroid symptoms or subnormal temperature. The effect of thyroid extract, however, is not constant.

Insulin.—Insulin has been used in several patients who ran markedly subnormal temperatures in the hope of promoting metabolism, and in this way keeping temperature at a higher level. In several cases it proved temporarily beneficial.

Iodids.—Potassium iodid is a time honored drug used in the treatment of asthma. Its effect, however, is very irregular, and it is difficult to state which type of case is likely to be relieved by it.

Salicyl Compounds.—Salicyl compounds, such as acetylsalicylic acid, have a sphere of usefulness in the treatment of asthma. They should be given in doses of 10 grains (0.65 gm.) every three to four hours throughout the night as well as during the day.

Habit-Forming Drugs.—Two drugs which are effective in the treatment of asthma are unfortunately habit-forming and should rarely be used; namely, drugs of the cocain series and drugs of the morphin series. Emergencies which justify their use rarely occur, and the dangers of producing morphinism by the use of this drug in chronic cases is great. It should only be used in desperate emergencies.

Anesthetics.—Anesthetics, such as chloroform, ether and alcohol, may have a sphere of usefulness in desperate cases. They should only be used temporarily and sparingly, however, as an emergency measure and with great caution.

(*To be Continued*)

News and Comment

COMMITTEE ON STUDY OF PROGRESSIVE DEAFNESS RECEIVES GRANT

The Committee on the Study of Progressive Deafness of the American Otological Society has been awarded a grant from the Carnegie Corporation to assist them in this work. The Committee will make an appeal shortly to the otologists of the country for cooperation in securing necropsy material to enable them to study the pathologic phase of the problem.

LOCAL SOCIETY MEETINGS

PHILADELPHIA: Section on Otology and Laryngology of the College of Physicians of Philadelphia meets on the third Wednesday of each month from October to June, at 8:30 p. m., at the College of Physicians. Chairman, Dr. Fielding O. Lewis; Secretary, Dr. James A. Babbitt, 2117 Chestnut Street.

CLEVELAND: Ophthalmological and Otolaryngological Section of Cleveland Academy of Medicine meets on the fourth Friday of each month at the Winton Hotel. Chairman, Dr. E. W. Garrett; Secretary, Dr. M. Paul Motto, Rose Building.

CHICAGO: Chicago Laryngological and Otological Society meets on the first Monday of the month from October to May at the Crystal Room, Great Northern Hotel. Chairman, Dr. E. H. Norcross; Secretary, Dr. A. A. Hayden, 25 East Washington Street.

MILWAUKEE: Milwaukee Oto-Ophthalmic Society meets on the third Tuesday of the month, at the University Club, at 6:30 p. m. President, Dr. John E. Guy; Sec.-Treas., Dr. John J. Brooks, Majestic Building.

KANSAS CITY, MO.: Kansas City Eye, Ear and Nose Society meets on the evening of the third Thursday of each month from September to May, at the Baltimore Hotel. The afternoons of the third Thursday of November, January and March are given over to clinical work. President, Dr. James May; Secretary, Dr. A. E. Eubank.

CORRECTION

The title of the paper by Dr. Louise Pearce, presented before the Chicago Laryngological and Otological Society in a joint meeting with the Chicago Ophthalmological Society, March 2, 1925, was incorrectly reported in the proceedings of that meeting, which appeared in the June issue. The title should read: "Factors Concerned in the Biology of Syphilitic Infections with Reference to the Specificity of Strains."

Abstracts from Current Literature

Ear

INVESTIGATIONS CONCERNING THE ESTIMATE OF SUGAR IN THE SPINAL FLUID IN OTOLOGIC DIAGNOSIS. PAUL OHNACKER, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:350 (July 20) 1925.

The healthy cerebrospinal fluid contains reducing substances (dextrose). Kopetzky has called attention to the importance of the presence of sugar for the diagnosis of meningitis and has found reduction missing in purulent otomeningitis, in meningococcus meningitis and in acute tubercular meningitis. Reduction was present in meningismus, in chronic tubercular meningitis, in the fluid of patients recovering from meningococcus meningitis and in other diseases. Kopetzky's idea did not find much response.

Holzmann mentions that sugar is scarcely ever found in acute infectious meningitis. Sugar was constantly absent in staphylococcus, streptococcus and pneumococcus meningitis. In the acute stage of epidemic meningitis and in tubercular meningitis there was a pronounced decrease. In subacute and chronic meningitis there were approximately normal values, and also a slight decrease. A decrease could also be noticed in profuse subarachnoidal hemorrhages and in meningitis accompanied by hemorrhage, abscess of the brain, in tabes dorsalis and in dementia paralytica, in dementia praecox (Mott) and diseases accompanied by leukopenia (Sicard and Rousseau-Langwelt). Low sugar values for meningitis were found by Kafka, Kahler, Steiner, Wittgenstein, Medi, Egerer-Seham and Nixon, Mangeri, Kelley, Moates and Keegan. Some, for instance, Steiner and Kahler, point to the special importance of the decrease for the diagnosis of tubercular meningitis. Loewy found increased values in meningitis. An increase was found especially in epidemic encephalitis (Moates and Keegan, Netter, Bloch and Dekeuwer, Wittgenstein, Kahler, Laporte and Rouzand, in tumor of the brain (Holzmann, Kahler, Steiner, Medi), in paralysis (Egerer-Seham and Nixon, Briand and Ronquier), in epilepsy (Kahler, Wittgenstein, Polonowski and Duhot), in diabetes, especially in coma diabeticum (Holzmann, Kahler, Egerer-Seham and Nixon), in idiocy and feeblemindedness (Polonowski and Duhot), in poliomyelitis (Steiner, Mestrezat), in apoplexy and encephalomalacia (Kahler), in almost all cerebral hemorrhages (Holzmann), in congestion of the liquor, in myelitis and encephalitis, in circumscribed infectious meningitis, in brain abscess without meningitis, in infectious diseases not accompanied by leukopenia (Holzmann), in serous meningitis, in hydrocephalus (Medi), in menstruation (Heilig and Hoff), in pneumonia with meningeal symptoms (Netter, Bloch and Dekeuwer), in a state of increased blood pressure, in essential hypertonia in consequence of an irritation of the vasomotor center and in states of irritation of the brain (Kahler). Partly normal or approximately normal values were found in the same diseases, for instance, in paralysis (Briand and Ronquier), in epilepsy (Polonowski and Duhot), in brain tumor (Egerer-Seham and Nixon), in abscess of the brain (Steiner), in infectious diseases (Steiner), in congestion of the liquor, in subacute and chronic meningitis, in convalescing epidemic meningitis, in poliomyelitis (Holzmann).

Normal values were found in treated syphilis (Kelley) neurasthenia, atherosclerosis, multiple sclerosis, cerebrospinal syphilis, tabes dorsalis and hemiplegia (Egerer-Seham and Nixon). The data concerning the normal value of reducing substances are not uniform. Holzmann mentions from 50 to 60 mg. per hundred cubic centimeters; Legroux 55 per cent., Briand and Ronquier about 45 per cent., never over 70 per cent., Egerer-Seham and Nixon, from 45 to 95 per cent.; Mestrezat, from 55 to 69 per cent.; later an average of 59 per cent.; Neisser, 50 per cent.; Borberg and Eskuchen, from 50 to 75 per cent.; Wittgenstein, from 45 to 60 per cent.; Depisch and Richter-Quittner, from 70 to 80 per cent.; Steiner, from 55 to 80 per cent.; Boom and Woensdregt, 70 per cent.; Moates and Keegan, from 40 to 68 per cent.; Kelley, from 40 to 100 per cent.; Servantie, from 50 to 65 per cent. The average value of these authors is about 60 mg. per hundred cubic centimeters. Higher values are given by Polonowski and Duhot, from 75 to 125 per cent. (average 100 per cent.); lower values by Kopetzky, from 20 to 40 mg. Boom and Woensdregt, Polonowski and Duhot found higher values after nourishment, the latter also after muscular efforts; Derrien and Pierron consider also psychic efforts, which Eskuchen declines. The views concerning the relationship to blood sugar vary. The liquor sugar value is below the blood sugar value, according to Wittgenstein, and is from 50 to 80 per cent. of the latter. Polonowski and Duhot assume a certain relationship so far as the spinal fluid only reflects attenuated average values of the blood sugar curve. According to Westrezat and others, this relationship is not established. Also in diabetes, in which an increase can occur when the plexus is injured by toxic influences (Holzmann), the relationship is not the same at all times (Egerer-Seham and Nixon). Kopetzky speaks also in normal cases of the changing demand of carbohydrates on the part of the central nervous system. Holzmann lays particular stress on the congestion for the increase, Kahler accuses increased transudation from the blood, Weigert affection of the plexus by toxic influence. Kahler also assumes a state of irritation of the brain, especially of Claude-Bernard's spot, which is caused through affinity of the virus to the mesocephalon, for instance, in encephalitis (Netter, Bloch and Dekeuwer). The decrease is caused, according to Kopetzky, by fermentative action of the microbes. Holzmann also assumes the avidity of the microbe for glucose. The tissues in immediate contact with the liquor attract the sugar through injury to the endothelium, just as, for instance, in a hemorrhage, the red and white blood corpuscles demand sugar for their nutrition (Westrezat). Kopetzky and others have pointed to the presence of milk sugar in the cerebrospinal fluid in all cases of meningitis. The quantitative sugar estimate is preferably done by the method of Bang, although a series of other partly analytic partly colorimetric methods have been mentioned. Ohnacker thought it to be worth while to investigate whether the statements can be confirmed for otogenic meningitis, and to what extent the determination of liquor sugar is of value in otology. Ohnacker's investigations lead him to the conclusion that the statement that the sugar content of the cerebrospinal fluid is diminished in meningitis, is not of general importance as many assume, and that it cannot be applied without reservation to otogenic meningitis. In fulminating meningitis the author found normal values beside decrease; in nonfulminating meningitis increase of the sugar content also. It is true that a decrease was found in the majority of cases in the fulminating form, in the nonfulminating form only in the minority of cases. In the prognostically unfavorable form of fulminating otogenic meningitis, reducing substances were missing in 29 per cent., dimin-

ished in 57 per cent., normal in 14 per cent. and increased in none. In the spinal fluid of nonfulminating nonotogenic meningitis the reducing substances were missing. In otogenic meningitis they were not missing. Reducing substances were missing in none, decreased in 31 per cent., normal in 63 per cent., increased in 6 per cent. A decrease does not exclude the diagnosis of meningitis, and a single positive finding does not give a favorable diagnosis, if one considers that, of the fulminating cases, also those ended fatally which did not show a decrease of the sugar content. On the other hand a total absence of reducing substances, especially when it is repeatedly established, will compel us to view meningitis with concern. This is also the case when the decrease continues and especially if the sugar value is sinking continuously. The changing sugar values correspond to the change which is found from one day to another, also concerning the color of the fluid, the kind of cells, the number of cells, and the protein content. The content of reducing substances depends on various influences which partly increase or decrease them. In meningitis, not only the sugar demand of the cell microbes which enter into immediate contact with the fluid must be taken into consideration, but also influences which increase the sugar, for instance, congestion, and possibly also increased transudation following injury to the plexus, especially when the blood sugar is increased. Especially important is the fact that not only the meninges but also the cerebrum is affected, when meningo-encephalitis is present. This influence of a state of irritation of the brain may be responsible for the fact that in this kind of meningitis the decrease of reducing substances is so frequently found missing (abscess of the brain). It is desirable that a comparative blood sugar estimate is made, although it must be taken into consideration that an increase in blood sugar may be caused centrally.

Does any relation exist between the sugar content of the spinal fluid and the other findings, namely, pressure, number of cells, albumin content, etc.? While Moates and Keegan deny any relationship, Wittgenstein claims that the increase in the number of cells which is present in every case of meningitis is reversely proportional to the decrease of the amount of sugar in the spinal fluid, although it is not mathematically exact. Also the proportional relation is not free of doubt. The importance of the sugar determination is clear in the diagnosis of lethargic encephalitis. In tumors of the brain and in hemorrhages, it is of help. Ohnacker cites some of his simple observations. He found in pachymeningitis hemorrhagica interna 0.039 per cent. of sugar with a clear normal spinal fluid. In a female patient with the clinical diagnosis of tumor of the cerebellum, he found 0.046 per cent. sugar, and with a pregnant patient with a large cerebellopontile angle tumor, on the left side, which originated from the vestibular nerve, he found 0.058 per cent. In both patients the spinal fluid was normal. In untreated syphilis of the brain he found 0.034 per cent. and 0.031 per cent. (globulin, Wassermann reaction +, no pleocytosis). In a severe relapse of the eighth nerve (230 mm. pressure, 578/3 lymphocytes, 0.070 per cent. total albumin) positive Pandy, positive Wassermann reaction there was 0.067 per cent. sugar before the treatment. After the treatment (120 mm. pressure), 16/3 lymphocytes, 0.050 per cent. total albumin, negative globulin reaction, negative Wassermann, 0.053 per cent. sugar. After a postparotitic process in the posterior cranial fossa (meningoencephalitis) there was a clear spinal fluid with 300 mm. pressure, ⅓ lymphocytes, 0.082 total albumin, negative Nonne and Pandy reactions, negative Wassermann reaction and 0.045 per cent. sugar. Three days later apparently after formation of an adhesion, the spinal fluid was clear, pressure zero +,

⅓ lymphocytes, 0.050 per cent. total albumin, a negative Nonne and a negative Pandy, and 0.056 per cent. sugar. Four months later the spinal fluid again showed normal values.

In an old case of hydrocephalus there was 0.057 per cent. sugar and an otherwise normal spinal fluid. Ohnacker mentions that a very rough picture of the power of reduction of the spinal fluid can be made. According to Holzmann, 4 drops of Fehling's solution are added to 2 c.c. of the spinal fluid and the mixture is heated to boiling point. Even if this is not an exact method, it allows some conclusions. The method can be used to detect a lack of decreasing substances and can make the diagnosis of an acute or tubercular meningitis sure. Ohnacker examines the spinal fluid of each patient by this method, besides making the quantitative examination, in order to find out whether a wider practical application of the simple method might be possible.

STUDIES CONCERNING THE SECONDARY CHOLESTEATOMA OF THE PETROUS BONE. KARL HELLMANN, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:406 (July 20) 1925.

Habermann's theory of the secondary cholesteatoma, which occurs during a chronic middle ear suppuration, assumed that the growth of epidermis from the drum membrane, or from the meatus, did not only occur in the beginning of the disease by virtue of ulcer formation and denudation of epithelium but that also later the normal epithelium of the tympanic cavity was destroyed and that its place was taken by the advancing epidermis. Hellmann investigated petrous bones on which no operation had been performed, or bones on which an operation had been performed. In the latter instances only those portions were studied which had not been touched by surgical interference and which offered natural conditions. The author distinguishes between two conditions. In one instance there was no thickening of the squamous epithelium of the cholesteatoma mass, and no tendency to penetrate into the subepithelial layers. Hellmann calls this a peaceful condition. It must be explained by the assumption that the cholesteatomous membrane does not grow at the expense of the columnar (cylindrical) epithelium. Such sharp border lines of columnar and squamous epithelium had been observed by Goerke in ear polyps. The other changes are entirely different. Hellmann calls them borderline processes, because they take place at the border between the squamous epithelium of the cholesteatoma membrane and the layer of columnar epithelium. The layer of squamous epithelium is thickened mostly through the widening of the prickle-cell layer. It is more powerful, as a rule, than in the other portion of the cholesteatoma. Narrow conical processes, broader tonguelike formations or noselike prominences emanate with regularity. The first cone proceeds on the surface of the tympanic cavity and continues the general direction of the cholesteatomatous membrane. This superficial cone stands in a peculiar and always repeated relation to the preexisting epithelium of the mucous membrane of the tympanic cavity. At the borderline between the two kinds of epithelium the surface cone lifts up the columnar epithelium and separates it from the subepithelial layers. The layers of columnar epithelium on one side are still in connection with the intact columnar epithelium. The further one goes from the margin of the squamous epithelium toward the interior of the cholesteatoma, the more symptoms of disintegration on the part of the columnar cells are encountered. Finally the columnar cells perish in the secretion of the tympanic cavity or in the cholesteatoma. The extension

of the field which the lifted layer of columnar epithelium occupies on the squamous epithelium changes from case to case. It is primarily dependent on the rapidity with which the parts which have been separated from the nourishing foundation lose their connection with the epithelial union and die. Processes of cornification in the squamous epithelium cones only set in after the disintegration of the undermined layer of columnar epithelium. Should the question arise how these changes can be explained, the answer must be that we see an active advance of the layer of squamous epithelium at the expense of the columnar epithelium. The process does not occur in the manner that the preformed epithelial layer of the tympanum ulcerates by virtue of a chronic suppuration and that the squamous epithelium then advances without resistance. On the contrary, the squamous epithelium carries on a fight of destruction against the layer of columnar epithelium, and its struggle ends in victory. The single phases of the battle can be described in the following manner. The squamous epithelium advances in the form of a wedge or cone against the columnar epithelium, and lifts it from its foundation by penetrating between the epithelium and the subepithelial layers. By this means the columnar epithelium is loaded on the squamous epithelium like on a shovel. The columnar epithelium now lies on the squamous epithelium. The layer of columnar epithelium, separated from its base, lies free in the tympanum and is destroyed. The cones of the squamous epithelium cause deformities and tensions in the subepithelial layers and cause a loosening of the epithelial covering by tension. It is probable that hereby changes in the blood supply and in the nourishment of the surface layers occur. The columnar epithelium can be lifted also without cone formation by the squamous epithelium. The columnar epithelium is not destroyed by a suppurative process but it is annihilated by the advancing squamous epithelium. Hellmann could prove in one case how little suppurative processes can be accused for the destruction of the epithelial coverings of cavities. He found in a petrous bone, on which an operation had been performed, layers of squamous epithelium in the niche of the round window which grew exuberantly in the walls between numerous small cysts. There was no suppurative process at this spot.

A conclusion concerning the age of the "borderline processes" can be drawn from the nature of the squamous epithelium cones, which always consist of juvenile cell elements and which never show typical symptoms of age by the formation of eleidin, keratohyalin or cornification. The investigator must be very careful to avoid flat sections. At the borderline between squamous and columnar epithelium, a reliable criterion is found for the direction of the cut. If the columnar epithelium in the cut is found to consist only of one line, one can be sure that the cut was made comparatively perpendicular to the surface of the tympanic cavity. If the columnar epithelium is hit diagonally, it looks entirely different. This system of propagation of the secondary cholesteatoma along the surface of cavities described before coincides with the views of Manasse. Two peculiarities present themselves clearly. First, the inclination of the advancing portion of squamous epithelium to propagate independently at the expense of other tissue, and second, the effort to penetrate into the depths of the chronically inflamed mucosa of the tympanum. At the periphery of the preformed cavities the implantation of epidermoidal foreign tissue is found, and progressive advance with projections against another kind of tissue. The kind of growth can be called tumorlike also in these processes.

Suppurative processes may perhaps induce the formation of cones. When the process has started, however, it may progress without suppurative inflam-

mation. Even acute suppurative processes can incite changes similar to the "borderline phenomena." Hellmann could show this in a case of scarlet fever otitis. At the border of the perforation of the drum membrane, squamous epithelium cones could be seen which stood in special relation to the still preserved epithelial cover of the tympanum and to the subepithelial tissue portions. As in cholesteatomas, a surface cone was present which had lifted the columnar epithelium from its base, and a peglike process leading to the depth, which had penetrated independently into the subepithelial layers. This shows how early processes can be induced which later are characteristic signs of a cholesteatomatous growth. The question arises, whether the characteristic type of growth of squamous epithelium can be called tumorlike in its very beginning and when the real cholesteatomatous growth begins. The problem is similar to the one concerning purely inflammatory hyperplasia and real tumor-formation. In the first stages not all signs are present which are later significant for the developed cholesteatoma. It is perhaps justifiable to speak of a precholesteatomatous stage, but the supposition has not been proved, that the form of growth that could be observed in scarlet fever otitis leads with certainty to a cholesteatoma. The conditions are favorable. The squamous epithelium, whether it is in the meatus or in the tympanum, carries in its germinal layer a so-called proliferating growth center (Borst), from which not only regenerative but also tumorlike processes can originate. Only an exciting cause is necessary to see a cholesteatoma develop. If this does not occur, only regenerative processes, for instance epidermization, without the formation of cholesteatoma may occur. The uncertainty of our knowledge concerning these impulses keep up the discussion of the cholesteatoma question. The formation of cholesteatoma must be considered as the result of several efforts and not the result of a single factor.

AMBERG, Detroit.

Nose

ACUTE ETHMOIDITIS WITH RUPTURE INTO THE ORBIT. ARTHUR C. JONES, Ann. Otol., Rhinol. & Laryngol. **34**:860-868 (Sept.) 1925.

The author reports three cases of orbital abscess secondary to acute ethmoiditis, and he feels that the following points are of extreme importance as factors in producing the dangerous condition of ethmoiditis with rupture into the orbit.

1. The youth of the patient and the probable lack of a firm, bony development.

2. The swelling of the mucosa of the ethmoid allowing the bacteria present to grow under anerobic conditions.

This anerobic condition causes tremendous pressure of the pus. This pressure is due to the carbonic acid which is formed by the organisms. The gas being unable to diffuse or pass out into the surrounding tissue, causes the increase in pressure.

The author believes that the fulminating character of acute ethmoiditis which breaks through into the orbit is due to a chemical action produced by the bacterial growth which leads to the formation of carbon dioxid under great pressure, and that the etiology is not always a defect in the osseous boundaries.

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CHANGES IN THE NOSE AND NASAL ACCESSORY CAVITIES IN MYELOID LEUKEMIA. HERMANN STERNBERG, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:371 (July 20) 1925.

Sternberg reports two cases of myeloid leukemia with the nasal accessory cavities affected. The necropsy of the first patient, a woman, aged 33, confirmed the diagnosis. Frontal sections through the nose and the nasal accessory cavities showed that the lower and middle turbinates were very much swollen and filled the lumen of the nose almost completely. The mucous membrane was pale yellow and showed fine granulations on the surface with numerous very minute hemorrhages. The mucous membrane of the septum was also irregularly swollen. The mucous membrane of the antrum of Highmore was very edematous, showing many hemorrhages. In both maxillary antrums, mucus and blood were found. The mucous membrane of the ethmoid cells, of the frontal and sphenoidal sinuses were more or less edematous and showed hemorrhages in spots. The histologic examination of all parts of the mucous membrane of the nasal cavity showed a dense, diffuse infiltration with myelocytes through the whole thickness of the mucous membrane. This infiltration started just under the epithelium and reached the osseous and cartilaginous border respectively. The bones of the septum and the bony skeleton of the lower turbinates showed, on the lower surface, an irregular formation caused by the presence of very numerous larger or smaller Howships lacunae with typical giant cells. The same condition but less pronounced was also found in the osseous portion of the middle turbinates and the rest of the lateral nasal wall. The mucous membrane of the accessory cavities showed a marked difference. Here the edema of the mucous membrane prevailed, but the infiltration was less pronounced. These infiltrations stood in direct connection with the leukemically changed bone marrow. The infiltration proceeded from the bone marrow and had penetrated into the mucous membrane of the accessory cavities along the open marrow spaces and along the communicating vessels. Hemorrhages completed the pathologic picture. It also could be observed that leukemic infiltrations penetrated from the narrow spaces of the bones surrounding the sphenoidal cavities and ethmoid cells into the cranial cavity and the dura respectively, and toward the optic nerve.

The second patient was a woman, aged 55. The patient became sick four weeks before entering the hospital. She suffered from pain in her throat and swelling on both sides of the neck. The pain increased. Two weeks before examination punctiform hemorrhages appeared over the whole body. The patient noticed a disagreeable odor from her mouth. The rhinolaryngologic finding when the patient was admitted to Hajek's clinic, June 3, showed an ulcer the size of a pea, with greasy coating, above the right upper canine tooth. Punctiform hemorrhages were found on the oral mucous membrane and on the tonsils. An ulcer the size of a pea with greasy covering was found on the posterior wall of the pharynx. This wall showed a color like yellow wax, especially at the sides. There was a small shallow ulcer at the cartilaginous portion of the septum on the right side. The mucous membranes were pale. In the submaxillary region on both sides masses of the lymph glands were present. As leukemia was suspected, the patient was transferred to the clinic of Professor Wenckenbach, where the diagnosis of myeloid leukemia was made. The patient died on June 9. The necropsy revealed myeloid leukemia, a necrotizing pharyngitis and a colloid carcinoma of the stomach. The nasal accessory cavities showed a moderate edema of the maxillary antrums and the ethmoid cells, and a more pronounced edema with hemorrhages especially of

the right sphenoidal cavity. The right ethmoid and sphenoid were examined histologically. The ethmoid showed only minor leukemic infiltration in the mucous membrane toward the nasal cavity (middle and upper turbinate), and minor processes of bone resorption. The mucous membrane of the ethmoid cells was a little edematous, and showed little periosteal infiltration in connection with a myelogenous changed portion of the bone marrow. The changes in the sphenoidal cavity were more pronounced. There was a severe edema of the mucous membrane with polyp formation, and a pronounced periosteal leukemic infiltration which was in connection with the myeloidally changed bone marrow. The bone showed resorption. At one spot the osseous border of the sphenoidal cavity toward the cranium was entirely missing and replaced by fibrous tissue. A broad communication was also present between the marrow space and the sheath of the optic nerve. Some leukemic infiltration was found in the optic nerve and its sheath.

The pathology of the mucous membrane of the nose and the nasal accessory cavities in these cases of leukemia shows a distinct difference of the morphology and physiology between the mucous membrane of the nose and that of the nasal accessory cavities. In the nose, there was a dense diffuse infiltration originating in the mucosa itself, in the accessory cavities only periosteally located infiltration which had penetrated secondarily into the mucosa from the marrow spaces of the bone. The mucosa of the accessory cavities is not able or only very little able to create leukemic infiltration. These leukemic infiltrations which penetrated from the marrow spaces of the bone into the accessory cavities and into the cranium show the connections which can exist between the nasal accessory cavities and the cranium. This route is frequently taken in infections.

ALCOHOL IRRIGATION WITH THE TYMPANIC CANNULA IN CHOLESTEATOMA. EUGEN HOPMANN, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:423 (July 20) 1925.

The conservative treatment of cholesteatoma can be carried out by irrigations with Bezold's tympanic cannula if a sufficiently wide connection of the tympanum with the adjoining spaces exists. The detached cholesteatoma membranes can scarcely be rinsed out completely. If water is used, the shreds of cholesteatoma swell. Pure alcohol prevents this swelling. The alcohol can be warmed on an electric stove, also, with some care, over a gas flame. It must be warmed a little above the body temperature because otherwise evaporation would cool the fluid so much that nystagmus and vertigo might result. Hopmann heats the alcohol to 104 F., and fills a 100 c.c. Record syringe with the same. The fluid is cooled off in the tube and cannula so that no caloric nystagmus occurs. The used alcohol can be filtered and used again. The bad odor of the used alcohol caused by the decomposition of the detached epithelium can be corrected by the addition of a little formaldehyd or ether. Hopmann had good results with about 30 patients. The fetid secretion decreased markedly in some patients after the second and third irrigation. Large cavities reaching into the mastoid process must be operated on. This operation is sometimes refused by the patient. The alcohol irrigation is a welcome help to keep the processes within reasonable bounds. For six years the author treated a woman for a rightsided cholesteatomatous suppuration. The drum membrane was missing. There was a rather wide entrance to the aditus at the antrum. The patient repeatedly refused to submit to an operation, which had been suggested to her by the author on account of frequently occurring pain on the right side of the head. After three or four alcohol irrigations on succeed-

ing days the ear became dry. When after some weeks, secretion set in again, two or three irrigations with the tympanic cannula sufficed to dry the ear. A physician had been the first patient on whom Hopmann tried the method. A few days after the alcohol irrigation the author could remove a cholesteatomatous mass the size of a cherry stone from the aditus at the antrum. Labyrinthine vertigo set in, and the patient was obliged to stay in bed for a few days. After the violent symptoms had disappeared the patient felt much better than before the treatment. The vertigo from which the patient had frequently suffered disappeared, and has not reappeared since the alcohol irrigation two years ago.

AMBERG, Detroit.

Miscellaneous

CONCERNING THE OPERATION OF THE ESOPHAGOTRACHEAL FISTULA. H. LOEBELL, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:377 (July 20) 1925.

A boy, aged 14, had carried a tracheal cannula since he was 4 years old. A tracheotomy was performed eleven years previously. Six weeks later a laryngofissure was performed. The boy carried an ordinary cannula at the second tracheal cartilage. An oblique occlusion of the trachea was present immediately under the larynx. On Aug. 28, 1923, a laryngofissure was done. On the posterior wall, under the glottis, a polypoid growth was found, with adjoining flat swellings of the mucosa. Polypoid growths were found to be prolapsed mucosa of the esophagus. A trial was made to close the freshened walls of the fistula with a purse string suture. The prolapse was made smaller thereby. The cartilagino-osseous proliferations were carefully removed from the cricoid cartilage. The vocal cords were found to be missing. The false vocal cords were present. Eight days later, Brueggemann's cannula, modified by Uffenorde, was introduced. Breathing was done through the larynx without trouble. Seven weeks later this cannula could be removed. It was found that the esophago-tracheal fistula had not been made essentially smaller by the laryngofissure. Galvanocaustic puncture, also nitrate of silver were employed, but a complete closure of the fistula could not be obtained. The patient was discharged after three months and returned every four or six weeks for treatment in the outpatient department. He could work and could make himself understood with a hoarse voice when he closed the opening in the larynx. Sixteen months after the operation a flat uneven prominence of the mucosa of the size of a pea was present at the posterior wall of the larynx. If the patient drank milk very rapidly a drop appeared in the larynx. A great irritability of the larynx and trachea persisted. On Dec. 28, 1924, the patient was readmitted to the clinic, and a major surgical operation, under local anesthesia, was performed by Professor Uffenorde, to close the fistula. The esophagus was approached through an incision at the anterior border of the left sternocleidomastoid muscle. The incision reached from the hyoid bone to the clavicle. The omohyoid muscle was severed. The comparatively large left lobe of the thyroid was carefully freed and held downward during the operation. The superior thyroid artery was tied. The esophagus ballooned when the patient swallowed. It was carefully freed from the posterior wall of the trachea and larynx. This was a somewhat difficult procedure, but it was accomplished successfully with a little enlargement of the esophagus fistula. The opening was about 2 cm. long, and was closed by a circular suture. The little tissue which was still present at the posterior wall of the larynx was used for a trial to close the fistula of the larynx. This, however, could not be done completely with four catgut ligatures. A tracheal cannula was intro-

duced because dyspnea set in when the larynx was pulled to the right side. The mobilized left left thyroid lobe was split by a frontal vertical incision and the disklike piece, consisting of the posterior surface of the thyroid, was interposed between the larynx and esophagus in such a manner that the capsular border of the thyroid was directed toward the esophagus. The lobe was fixed in this position by several stitches. The skin incision was closed at its upper and lower borders, and a glass drainage tube with an iodoform gauze strip was introduced reaching the plastic; another drain led from the lower border of the wound. A dry dressing was applied. The further course was without reaction, although the patient ate some soft food by mistake on the third day after the operation. On the sixth day after the operation the patient swallowed soft and liquid food without difficulty. During the first days the wound secreted some milky cloudy fluid probably from the thyroid gland. The esophagotracheal fistula had healed. A cannula was reintroduced, because by a protrusion of the left wall of the trachea the lumen was narrowed to about two-thirds of its normal size in the region of the cricoid cartilage and the first and second tracheal rings. After four weeks the trachea was sufficiently wide, and the tracheal opening was closed March 26. Concerning the symptomatology, Loebell found in the literature that fistulas may not cause any symptoms for months or years. His patient never had coughing spells during the eleven years after partaking of fluids or food, and had never shown symptoms pointing to a connection between the trachea and the esophagus.

Other cases are quoted from the literature. Among other instances the author quotes Wilms, who suggested interposing muscle tissue between the trachea and the esophagus. Von Navratil mobilized, in dogs, the corresponding lobe of the thyroid and placed it between the fistular openings which had been closed previously. This method was tried on a patient once successfully by Pfeiffer. This patient had been subjected five months previously to a laryngofissure. Stitching and cauterization by galvanocautery and with nitrate of silver had not been successful. The condition in Loebell's patient was different from that of Pfeiffer's patient, who had suffered from a fistula only a few months after an injury by shooting, whereas in Loebell's patient the opening between the trachea and the esophagus had lasted eleven years.

AMBERG, Detroit.

CONTRIBUTION TO THE MECHANICS OF THE DEVELOPMENT OF HEMORRHAGES IN THE TEMPORAL BONE CAUSED BY INJURY DURING BIRTH. J. BERBERICH and M. STERN, Ztschr. f. Hals-, Nasen-u. Ohrenh. **11**:383 (July 20) 1925.

The great majority of births are head presentations (from 95 to 97 per cent.). The effects of injury to the skull of the child take a prominent place when considering birth injuries. In the older reports (Seitz, Beneke, Yllpoe and others), mechanical circumstances were considered especially the clipping off of parts, contusions, compressions, strangulation and injuries by forceps as a cause of changes in the skull (cephalehematoma, caput succedaneum, tears of the tentorium, pia and cerebral hemorrhages). Schwartz believes the cerebral hemorrhages of the new-born are mainly caused by the difference of the pressure in the uterus and in the atmosphere. It is known that an even pressure on all parts of the fetus exists when the amniotic sac is intact. The pressure amounts to from 80 to 250 mm. of mercury. At the moment when the amniotic sac bursts, the protruding portion of the fetus closes the open os uteri like a ball valve. The parts in the uterus are still subjected to the high pressure and a part of the body surface (in cranial presentations a part of

the head) is suddenly relieved of this pressure. If we place on any part of the body a Biers suction bell, a swelling occurs corresponding to the power of suction, because the mobile fluids of the organism flow into that part of the organism which is freed from the ordinary pressure of the atmosphere. At the moment when the head of the fetus, after bursting of the sac, occludes the os uteri like a ball valve, the great difference in pressure between the uterus and the atmosphere causes that part of the body which lies outside the uterus to be exposed to an influence corresponding to that of a large Biers suction bell; the fluids of the body are drawn to the spot at which suction occurs. If this difference of pressure is continued sufficiently long, a hyperemia of the vessels in the suction region must occur and, at last, the vessels are torn. The caput succedaneum and cephalematoma can be explained in this manner.

It can easily be imagined that by sufficiently great suction of the veins of the scalp and of the longitudinal sinus not only these veins but the veins which stand in connection with the same and the sinus are filled with blood, and finally they tear. Schwartz explains in this manner the pial and the intercerebral hemorrhages. This view of Schwartz is corroborated by earlier investigations of Stumpf, Sicherer, Paul, Hippel and others, who found hemorrhages in the fundus of the eyes of the new-born. These authors looked on them to be distant effects of birth injury. Voss established a typical symptomatology of the birth injuries of the new-born. In numerous cases Voss could show hemorrhages histologically in the temporal bone of the new-born, which were the result of birth injury. Bruehl could show connection of the veins of the tympanic cavity with the superior petrosal sinus. Other authors (Ostmann, v. Troeltsch), pointed out vessel connections between the middle ear and the cranial cavity. Berberich and Stern confined their studies only to the venous connections. Manasse, Politzer, Urbantschitsch, v. Troeltsch, Siebenmann, Zange and Brieger did not only find vessel connections between the middle and the inner ear, but also with the superior and inferior petrosal sinuses. If, according to Schwartz, a congestion occurs in the longitudinal sinus the stasis can take place through the long course of the longitudinal, transversal, and sigmoid sinuses or by the way of the short stretch of the anastomosis veins, the cavernous sinus and the inferior and superior petrosal veins, and it can extend to the smaller veins of the brain, the vena magna galens, vena cerebri interna, vena terminalis, vena cerebelli, vena lateralis ventriculi. Berberich and Stern made experiments by injections on the cadaver in order to make visible the venous connections between the longitudinal sinus and the temporal bone, respectively, of the brain. The cadavers of children and adults were used. If a strong pressure is used, it is possible to tear fine branches in the inner ear and the injected mass can be found in the endolymphatic and perilymphatic spaces. The authors conclude that:

1. The veins of the brain and of the temporal bone can be filled evenly to the smallest branches by injecting any kind of a fluid into the longitudinal sinus of the cadaver.

2. In this manner it can also be proved that the veins of the temporal bone belong to the great vessel system of the superior longitudinal sinus.

3. These investigations brought a further proof that hemorrhages in the petrous bone by birth injury (Voss) can develop by suction, with consecutive disturbance of the circulation in the superior longitudinal sinus, and in the venous vessel system which stands in connection with the same.

AMBERG, Detroit.

Society Transactions

AMERICAN LARYNGOLOGICAL, RHINOLOGICAL AND OTOLOGICAL SOCIETY

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W. H. Haskin, M.D., *President*

May 22, Morning Session

Mastoiditis in Diabetes Complicated with Diabetic Facial Paralysis. Presented by Dr. E. M. Seydell, Wichita, Kans.

The causative factors in the complications in diabetes are discussed under the following headings: Nutritional disturbances, increase of sugar in the blood and tissues, toxic substances elaborated in the system and changes in the blood vessels.

In diabetic patients, there is a greater tendency to suppuration of the middle ear and temporal bone than in nondiabetic patients. Consequently the following complications are not uncommonly met with: otitis media, mastoiditis with or without sequestrum, sinus thrombosis, brain abscess, periarticular abscess of the maxillary joint, abducens paralysis, deafness, vestibular nerve involvement, and facial paralysis. These are discussed but chief emphasis is placed on the last complication.

The nervous complications of diabetes are divided into sensory changes, motor changes and trophic disturbances. The relationship of these complications to the nerves of the ear and other parts of the body is discussed, and the literature of the pathologic changes taking place in such nerves is also reviewed.

In conclusion, two very interesting cases of mastoiditis in diabetics, complicated with facial paralysis, are reported. The history, symptomatology, clinical course and result of treatment, all point to an involvement of the facial nerve due to the diabetes rather than to the accompanying mastoiditis.

DISCUSSION

Dr. J. C. Beck, Chicago, considered mastoiditis as a focus of infection influencing the diabetes and felt that operation should be performed in all cases.

Gastro-Intestinal Disturbances in Infants as a Result of Obscure Infection of the Mastoid. Presented by Drs. Harry W. Lyman and Arthur M. Alden, St. Louis, Mo.

Gastro-intestinal disturbances in infants, characterized by vomiting, diarrhea, loss of weight and athrepsia, are sometimes due to toxemia from a focal infection, instead of from improper feeding. This focal infection may be located in the middle ear, and until this infection is relieved, dietetic measures will have no appreciable effect. Because of the fact that the middle ear and mastoid antrum of infants are more or less completely filled with embryonal tissue, paracentesis may not be sufficient to drain this focus, in which case it is necessary, in order to secure adequate drainage, to perform a mastoid

antrotomy. This operation is not a formidable procedure and can be done under local anesthesia with little or no surgical shock.

The author's findings are based on a series of fifteen patients, ranging in age from 2 to 14 months, on whom either a single or double mastoid operation was performed. Eight recovered and seven succumbed. Hemolytic streptococcus was demonstrated in ten of the fifteen cases, pneumococcus in two, and the cultures were lost in the remainder.

DISCUSSION

Dr. J. W. Park, Harrisburg, Pa., cited the case of a patient with severe symptoms of vomiting, fever and diarrhea, who was cured by simple incision of the drum.

Dr. J. B. Potts, Omaha, reported a patient presenting similar symptoms who died, despite double mastoid operation and radical intravenous therapy.

Dr. R. B. Canfield, Ann Arbor, Mich., described two hospital epidemics of diarrhea with otitis media, and warned against the danger of spreading infection from one child to another.

Dr. J. Barnhill called attention to the possibility of needless operations on these patients and the risk incurred when the diagnosis was at all uncertain.

Dr. J. H. Allen, Portland, Me., emphasized the need of operation in cases in which embryonal tissue is still present in the mastoid and tympanic cavities, and prevents adequate drainage through the opened drum. Operation should be done only in conjunction with all the routine pediatric therapeusis, and all idiopathic gastro-intestinal conditions presenting these symptoms should be carefully ruled out, together with any other possible focus except the mastoid.

Dr. L. W. Dean, Iowa City, recounted his experience with early unsuspected cases of this type of mastoiditis, diagnosed only at necropsy. Such patients are now saved by early antral drainage, the severity of the symptoms being the indication for operation. Prognosis depends on the degree of dehydration and the ability of the child to assimilate liquid nourishment.

The Unsatisfactory Effects of Postoperative Irrigation in Certain Cases of Chronic Paranasal Sinusitis. Presented by Dr. H. I. Lillie, Rochester, Minn.

Five illustrative cases of chronic paranasal sinus disease were reported, in which it was shown clinically that frequent postoperative irrigation had apparently defeated the purpose of well-directed surgical treatment. The symptoms resulting were controlled by discontinuing irrigation and removing the products of the reparative process by other mechanical means.

Irrigation has been, and still is, a suitable postoperative measure in a great number of patients, even though some do not react favorably to it. All manifestations of water logging of the mucous membrane may be observed in the latter cases.

It has been found that nearly all postoperative paranasal sinus wounds may be treated satisfactorily by the dry method. The indiscriminate use of nasal douching for all manner of nose complaints should be discouraged.

DISCUSSION

Dr. Ross Skillern, Philadelphia, described his method of antral irrigation with physiologic sodium chlorid solution. Cures have been reported after

prolonged irrigation but usually if no improvement follows a few irrigations, surgery is indicated. A change in the character of the fluid from purulent to nonpurulent is a good prognostic sign.

Dr. Francis P. Emerson, Boston, stated that irrigation was not indicated so long as drainage was adequate, since there is danger of washing away the protecting mucus and of formation of granulations. A rise in temperature or drainage obstruction are indications for irrigation.

Dr. Barnhill expressed himself as against general nasal douching but as in favor of postoperative irrigation. His routine treatment is that of irrigation in acute antral infections and radical operation in chronic infections.

Dr. William Haskin, New York, strongly advocated the use of suction in sinus disease, and stated that its use with him had supplanted all radical sinus surgery.

Dr. Isaac Kelley, Jr., St. Louis, described the general tendency to therapeutic douching, which leads to nasal pathologic changes. He cited a patient made worse by douching and cured by omitting it.

Dr. Lillie (closing) emphasized the fact that while some irrigation is valuable too much is quite harmful.

The Diagnosis of Lateral Sinus Thrombosis. Presented by Dr. Curtis C. Eves, Philadelphia.

The importance of an early diagnosis in sinus infection should not be overshadowed by the discussion of intravenous therapy and spontaneous cure. Early diagnosis, made by painstaking study of early signs and symptoms and followed by surgical treatment is the only safe method.

The important signs and symptoms of: (1) pain over the affected side of the head, (2) edema over mastoid emissary area, (3) tenderness along course of jugular vein, (4) eyeground changes, (5) chills, and (6) fever, are discussed, together with the bacteriology of this syndrome.

At the time of mastoid operation necrotic changes in the sinus plate and wall of the vein furnish important data. Palpation of an exposed sinus gives evidence of a clot if doughiness or hardness is felt. A partial clot will sometimes give a vibratory sensation.

In double mastoiditis the findings at primary operation, the duration of the infection, the unilateral culture of *Streptococcus hemolyticus*, pneumococcus or bacillus mucosus capsulatus, afford important localizing evidence.

In children, diagnosis must necessarily be largely one of elimination. Early symptoms and signs of sinus infection complicating mastoiditis are temperature of any character, pain on the side of head affected, edema of area drained by emissary vein, dryness of lips, coated tongue, loss of appetite, inability to sleep well, in an otherwise comfortable patient.

Provided other bodily conditions are eliminated, temperature associated with one or more of the foregoing signs occurring several days after mastoidectomy is sufficient to put the otologist on the watch for sinus infection, and calls for opening of the sinus provided the appearance at the original operation was at all suspicious.

To give the patient the best chance for recovery without prolonged convalescence with metastases, the interior of the sinus should be inspected before septic temperature, chills and positive blood culture are present.

DISCUSSION

Dr. Gordon Berry, Worcester, Mass., mentioned a case in which the use of the spinal fluid manometer had afforded a definite lateralization of a sinus thrombosis.

Dr. Ewing Day, Pittsburgh, raised objections to diagnositic puncture of the lateral sinus and described his method of opening it by layers and of removing the clots and thrombi by strong suction.

Dr. Barnhill called attention to his observation that in double mastoiditis the side bleeding most freely was most likely to be the site of a future sinus thrombosis.

Dr. James Babbitt, Philadelphia, urged the consideration of embolic foci developing from an unsuspected sinus thrombosis and the need of investigating any symptoms of sepsis. He thoroughly outlined the manometer test for thrombosis in both partial and total occlusion.

Dr. Lyman mentioned a test for sinus thrombosis by the production of headache by means of jugular compression on the normal side. He favors the opening of any suspicious looking sinus even if found normal.

Dr. Canfield cautioned against the confusion of the signs of sinus thrombosis with those of infection of the diploetic fluid in temporal osteomyelitis, pointing out the more favorable prognosis in the latter.

Dr. Eves (closing) justified his sinus puncture in double mastoiditis when both sinuses are exposed.

Artificial Pneumothorax in the Treatment of Pulmonary Tuberculosis and Its Effects on the Larynx. Presented by Dr. J. P. Dworetzky, Liberty, N. Y.

The writer has been employing artificial pneumothorax in the treatment of pulmonary tuberculosis. Suitable cases for this form of treatment are those of progressive tuberculosis, preferably unilateral, presenting fever, cough, expectoration or hemoptysis, which do not yield to the ordinary hygienic-dietetic treatment.

During the last two years, the writer has made careful observation on the effects of artificial pneumothorax on the larynx, and he has never found a single instance in which the patient so treated developed tuberculosis of the larynx.

The writer also observed that patients with pulmonary tuberculosis who presented a co-existing laryngeal lesion showed marked improvement of the larynx under artificial pneumothorax treatment. Out of thirty-two cases of laryngopulmonary tuberculosis, twenty-six were cured or definitely improved, two died and four remained stationary. In these four cases, the lung collapse was not complete.

DISCUSSION

Dr. Mullen commented on the discrepancy between the author's results and those throughout the country at large. Only unfavorable cases come to pneumothorax and they are as likely to develop tuberculous laryngitis or nephritis with lung collapse as without it, provided that the infection has become a blood stream one. Discussion closed with the mention of unilateral laryngeal tuberculosis and its treatment by operation on the recurrent laryngeal nerve on that side.

Dr. Bert Shurly, Detroit, considered the larynx to be involved in 15 per cent. of all cases of pulmonary tuberculosis, always as a secondary infection. A unilateral pneumothorax is not curative in a bilateral laryngeal involvement, though it helps to promote general improvement in the patient's condition.

Dr. Carmody spoke of the impossibility of collapsing the lung at times because of adhesions. He felt that the author's statistics for cured cases were too high, as he had seen pneumothorax patients who had failed to improve.

Dr. Dworetzky (closing) emphasized the fact that lung collapse will not prevent laryngeal involvement in all cases. Moreover, the pneumothorax must be itself a successful one and must be used in properly selected cases.

AFTERNOON SESSION

Laryngofissure for Cancer of the Larynx. Presented by Dr. Gabriel Tucker, Philadelphia. To be published in full in a later issue.

Pneumonography. Presented by Dr. Louis H. Clerf, Philadelphia.

Ever since 1905, when Chevalier Jackson first used a radio-opaque substance for outlining the tracheobronchial tree, the value of pneumonography, as a diagnostic aid, has steadily advanced.

The author reviews the progress of pneumonography since that time with especial reference to the materials used and the methods of introduction. Barium sulphate in powder form and sodium iodid and bromid have been tried but the results have not been satisfactory although no untoward effects were experienced in their use. He believes that the safest substance for bronchoscopic insufflation is bismuth subcarbonate.

Lipiodol has been used by bronchoscopic instillation with excellent results.

After detailing the technic of introduction, the writer concludes that the Jackson method of bronchoscopic insufflation of bismuth subcarbonate into the tracheobronchial tree is unattended with harmful effects.

In the case of penetrating foreign bodies, the increased visibility of the bronchial tree will help the roentgenologist to supply information which will assist in determining the best method of removal.

In cases of lung suppuration, a more accurate determination regarding the location and extent of the process is possible, and will often be of great assistance in deciding the proper form of treatment.

Lung mapping combined with a diagnostic bronchoscopy will often lead to an early diagnosis in neoplasm of the lung. Pneumonography used in conjunction with roentgenology affords the best available diagnostic aid to the thoracic surgeon.

DISCUSSION

Dr. Orton, Newark, mentioned a patient in whom bismuth accidentally ran into the trachea without the slightest harmful result in a case of laryngeal paralysis, and advocated the use of nonopaque solutions in the bronchi as an aid to foreign body location.

Dr. Lukens, Philadelphia, cited a case in which an abdominal wall sinus was filled with a large amount of bismuth, following which the solution was expectorated and found to be present throughout the whole right lung.

Ciliary Inhibition or Destruction in Tracheobronchial Asthma. Presented by Dr. W. F. Moore, Philadelphia.

A brief review of the author's original work in this field is followed by an account of his more recent findings. He stresses the importance of eradicat-

ing any causative pathologic conditions in the nose and sinuses, and of eliminating any systemic diseases which may be producing bronchial symptoms. He considers asthmatic attacks to be due to clogging of bronchial cilia overloaded by accumulated secretion, removal of which can be accomplished by bronchoscopy. The bacteriology of the condition is discussed, together with the results from the use of vaccines. Microscopic examination of secretions shows definite changes in the ciliary structure of the epithelial cells, and improvement in the patient's condition is found to coincide with a return of the cilia to more normal function and structure. Local pathology as seen bronchoscopically is described, together with a classification of the different types of secretion. The average number of bronchoscopies to each case was seven, resulting in the cure of the patient in 25 per cent. of the cases, an improvement in 40 per cent., a great improvement in 20 per cent. and no improvement in 15 per cent.

DISCUSSION

Dr. G. R. Moffett, Philadelphia, described the microscopic findings in examination of bronchial cilia, particularly with regard to their number and movements. He further showed the importance of a careful study of the leukocytes and their detailed structure, and concluded with an allusion to bronchial expansion and contraction as being an effort by the patient to rid himself of the accumulated bronchial secretions.

Dr. G. Keiper, Lafayette, Ind., reported one of the earliest asthmatic cases treated bronchoscopically, and expressed the idea that bronchoscopy was a very favorable stimulant to expectoration.

Dr. Moore (closing) answered questions as to the use of cocain-epinephrin mixture in the bronchi, and said that neither this nor bronchoscopy itself had any tendency to precipitate or aggravate an asthmatic attack.

Some Esophageal Findings. Presented by Dr. Charles J. Imperatori, New York. Published in full in this issue.

DISCUSSION

Dr. L. Clerf commented on the value of a combined use of both the roentgen ray and the esophagoscope in dealing with lesions of the esophagus.

Dr. E. L. Van Sant, Philadelphia, mentioned the great possibility of errors in roentgen-ray diagnosis of esophageal lesions, and showed that attention to the type and consistency of the barium mixture is important. He also discussed the permanence of dilatation of a toneless esophageal wall following a cure of a stricture.

May 23, Morning Session

The Treatment of Alveolar Fistula Secondary to the Extraction of Teeth. Presented by Dr. Horace R. Lyons, Chicago.

The anatomic relations between the upper teeth, especially the lateral incisor or the first and second molar, are such that alveolar fistulas can easily result from the extraction of teeth. Publications, textbooks, and experience in operating by an external method prove that the existence of a dental root normally within the antrum is exceedingly rare.

The causes of alveolar fistulas are divided into four groups:

1. Dental roots lying within the antrum, which when extracted cause a fistula.

2. Roots extending to, but not through, the floor of the antrum pushed by an accident in extraction into the antrum.

3. Dental apical abscesses or granulomas breaking down the floor of the antrum resulting in a fistula after extraction of the tooth.

4. Large group, involving the production of a fistula by an accident in the process of simple extraction or by process of curettement.

Early treatment by the rhinologist is recommended, subdivided as follows:

Acute Cases: Large window resection through inferior meatus followed by suction treatment. Simple curettement of fistula and simple suture.

Chronic Cases: Large window resection and suction treatment until antrum is cleared of the infection, followed by excision of the fistulous tract and curettement of the surrounding alveolar process if infected. Simple suture of soft parts will suffice if the fistula is small or a delayed flap transplant from the hard palate in cases of large fistulas. No treatment is ever attempted through the fistula.

The writer reviewed 100 cases, the results of which he published in 1922.

DISCUSSION

Dr. Horace Newhart, Minneapolis, commented on the lack of literature on this subject and on the rarity of primary maxillary sinusitis. He regards radical operation as definitely indicated in sinusitis with alveolar fistula.

Dr. Beck regretted the frequent tendency of the dentist to curet a tooth socket and thus cause a fistula, mentioned the harmful effect on a fistula of forceful nose blowing, and described his particular technic for closing an alveolar fistula.

Dr. Thomas Carmody, Denver, called attention to the danger of a dentist forcing a tooth root into the maxillary sinus and of the harmful effects of curetting the socket. The sinus may become infected independently from some other source such as an ethmoid infection, and the fistula will only close when this other focus is eradiacted. Teeth may become secondarily infected from an antrum.

Dr. Louis E. Brown, Akron, O., urged the need of cooperation between the dentist and laryngologist and the importance of postponing any plastic work on the fistula until the antral infection is cured.

Dr. Lyons (closing), did not consider fistula an absolute indication for the radical operation, but emphasized the value of early treatment of the patients before chronic changes have occurred in the alveolus.

A Case of Furuncle of the Nose, with Septicemia Treated by Mercurochrome-220 Soluble. Presented by Dr. Thomas J. Harris, New York.

After showing the rarity of satisfactory reports of this condition, the author cites the case of a young girl, who, after having a furuncle of the nose incised, developed staphylococcus septicemia, together with lid abscesses, pleurisy, endocarditis and pneumonia. After two blood transfusions she was given 26 c.c. of 1 per cent. mercurochrome-220 soluble, repeated three times at varying intervals. Blood cultures became negative, general improvement in the patient's condition occurred, and after a protracted convalescence under medical care an essential cure resulted.

The author mentions two other patients who developed cavernous sinus thrombosis and shows this complication to be due probably to the absence of valves in the veins leading to the sinus. He strongly advises against any

surgical treatment of nasal furunculosis other than perhaps the Hurd method of warm applications, very slight incision, and suction. He discusses various radical operative procedures such as facial vein and superior ophthalmic vein ligation and Eagleton's recent treatment of cavernous sinus thrombosis with carotid ligation. He concludes with his opinion of the generally beneficial results of the use of mercurochrome in septicemia.

DISCUSSION

Dr. W. P. Eagleton, Newark, N. J., discussed the pathology of the furuncle, its production of thrombophlebitis in nearby veins, and the danger of spreading this by incision or pressure. He called attention to the possible danger of nephritis and cerebral hemorrhage resulting from the use of mercurochrome.

Dr. C. T. Porter, Boston, recounted twenty patients with sinus thrombosis treated by intravenous mercurochrome, one of whom, showing double mastoiditis and septicemia, had acute nephritis on entrance to the hospital.

Dr. Samuel Kopetsky, New York, reported three cases of this condition, with two deaths, one from cavernous sinus thrombosis, and one from septic pneumonia. His results from the use of mercurochrome had been rather disappointing.

Otogenic Paralysis of the Abducens, with Especial Mention of Isolated Palsy Associated with Irrigation of the Gasserian Ganglion. Presented by Dr. W. Hardin Sears, Huntingdon, Pa.

In a long and comprehensive article, the author has collected and tabulated both his own cases and those from the literature, from which he draws the following conclusions:

1. Isolated paralysis of the abducens associated with irritation of the gasserian ganglion is a relatively rare complication of acute suppurative otitis media.

2. Pain of gasserian type is commonly associated with otegenic paralysis of the abducens, so that the Gradenigo triad of symptoms will be present as a rule in any such palsy.

3. Many cases reported under the Gradenigo syndrome are classified incorrectly from an etiologic basis.

4. The thorough study of the infecting organism in any acute otitis, with routine culturing and typing, may give indication for operative interference before a palsy occurs, and lessen the mortality following its occurrence.

The author concludes with several hypotheses and suggestions for further study and investigation.

DISCUSSION

Dr. G. Coates, Philadelphia, commented on the number of cases of this syndrome undiagnosed or unreported. He pointed out the liability of the existence of other pathways of infection beside the petrous portion of the temporal bone, and suggested that more radical surgery might lead to better results.

Dr. Kopetzky cited three cases to shown that this syndrome is essentially a localized meningitis as shown by spinal fluid examination.

Dr. Eagleton, pointed out the seriousness of this condition, and the fact that cystern puncture may reveal infection even when the spinal fluid is negative. Similar signs may be present in sinus thrombosis.

Dr. Day called attention to other brain conditions causing a similar picture, and stressed the need of early treatment of the deep petrous cells to prevent a generalized meningitis.

Dr. W. L. Culbert, New York, mentioned a number of patients who had recovered without operation.

Dr. Sears (closing) also cited patients who had recovered following incision of the drum only. Roentgenograms have proved to be of little diagnostic help in these cases.

Afternoon Session

The Therapeutic and Prophylactic Value of Tonsillectomy in the Active Stage of Vincent's Angina. Presented by Dr. Samuel B. Westlake, St. Louis.

The writer advocates tonsillectomy during the active stage of Vincent's angina as a satisfactory method of cure. His conclusions are based on fifteen cases, in which there has been no recurrence.

Careful bacteriologic examinations made before, during and after the operations, reveal that the fusiform bacilli and the spirilla disappeared almost immediately after operation. In fact in some patients in whom they occurred in large numbers before operation, they could not be found within a few minutes after the removal of the tonsils.

His conclusions are as follows:

1. An active severe Vincent's angina is no contraindication to tonsillectomy.
2. Relief from the symptoms follows the tonsillectomy.
3. Recurrence is unlikely.
4. The tonsil is an important factor in the chronicity and recurrence of the disease.
5. The spirilla and fusiform bacilli associated with the disease almost instantly disappear after operation.

Optic Canals in Optic Atrophy. Presented by Dr. Leon E. White, Boston.

In a third paper devoted to the study of optic canals the author summarizes his previous work and further analyzes sixty-seven cases of optic atrophy. These are divided into groups according to the size of the optic canal and the etiologic systemic disease.

Abnormally large optic canals seem usually due to increased intracranial pressure.

Infantile optic atrophy does not seem to be a factor in the production of small canals. Any pathologic process tending to produce atrophy is greatly accentuated by the presence of abnormally small canals.

Discussion

Dr. Skillern expressed his uncertainty as to the actual rôle played by the optic canal in optic atrophy and his lack of enthusiasm for any operative enlargement of the canal.

Dr. John MacKenty, New York, reported three cases of this type, one which cleared up under local treatment, one in which a radical sinus exenteration was done, which was cured, and one in which operation failed to improve the vision.

DR. WHITE (closing) reiterated his feeling that radical enlargement of the canal should be kept in mind as a procedure which has been successfully done and might be resorted to as a last measure.

THE END-RESULTS OF SINUS SURGERY IN CHILDREN. Presented by DR. J. J. SHEA, Memphis, Tenn. Published in full in August issue.

The end-results of sinus surgery in children compare favorably with those obtained in adults. The initial improvement is generally gratifying, but the attainment of permanent relief is difficult, for the disease tends to be progressive and may be based on an inherited weakness. Radical surgery on the paranasal sinuses of children is seldom necessary and when instituted requires protracted postoperative care, the same as radical mastoid surgery on the growing ear. In both instances the radical element is overcome by the further growth of the sinus or the mastoid process. In the past we have been taught to believe that any surgical interference would stop the growth and the development of the external nose and the paranasal sinuses. Disease will arrest the development of the sinuses, but by re-establishing the normal ventilation and drainage of the undeveloped sinuses through surgery, they will begin to grow again and in many instances regain the lost development. The question is considered of the susceptibility of the sinuses to infection following the removal of the tonsils and adenoids.

The author includes a long list of various diseases in children for which he advises treatment of the antrum, and concludes by describing his operative technic in securing antral drainage.

DISCUSSION

DR. W. V. MULLIN, Colorado Springs, Col., felt that inheritance and epidemics play a large part in sinus infection, that heliotherapy is useful in the laryngitis cases, and that possible etiologic medical diseases must be carefully ruled out by the pediatricians before sinus therapy is undertaken.

DR. DEAN exhibited some slides showing pathological infantile ethmoidal bone and discussed the conditions related to this and the bony pathology of sinus infection.

DR. L. A. SCHIPPER, Bismark, N. D., described a case of sudden blindness with ocular and peripheral palsies and choked disks which was cured by tonsillectomy, drainage of the sinuses, and irrigations with potassium permanganate. A recurrence of similar symptoms was controlled by reopening of the antrum.

DR. J. G. COLLISON, New York, mentioned his habit of removing all the sinus mucous membrane in the chronic, deeply involved cases, and the good results following the use of the quartz light.

DR. SHEA (closing) spoke of the difficulty in obtaining specimens of sinus membrane for microscopic study, of the importance of drainage by use of the rubber tube, and of the value of postoperative pediatric treatment.

MALIGNANCY OF THE EXTERNAL NOSE WITH REPORT OF CASE OF ROENTGEN-RAY ORIGIN. Presented by DR. R. A. BARLOW, Madison, Wis.

The epithelial structures of the skin, particularly the face and hands, are especially susceptible to the roentgen rays. A case is reported in which repeated exposure of the patient to the roentgen rays precipitated malignant changes in the skin over the nose, with a resulting extensive carcinoma of the

prickle cell type. The ultraviolet light may also be held responsible for initiating or at least encouraging malignant changes in a benign condition.

All rodent ulcers of the nose should be regarded as potentially malignant. Microscopic examination of a single specimen is not sufficient to rule out neoplasm, as examination of serial sections throughout the mass usually reveals areas of malignant change manifested by characteristic pear formation.

Growths characterized by a disposition of the multiplying cells to complete the natural differentiation and pass through the prickle cell stage to that of keratinization are true carcinoma spinocellulare. For all practical purposes, the various microscopic pictures in which either prickle cell formation or keratinization may predominate may be regarded simply as degrees of one highly malignant process.

Treatment consists in early and wide excision of the lesion by knife or cautery. Lesions of roentgen-ray origin are highly malignant and extremely resistant to treatment. The whole face may be on the verge of malignant change due to overexposure and any attempt at treatment will be futile, as new growth may spring up at the margin.

DISCUSSION

Dr. Green mentioned certain organs in which radiation is unsatisfactory even if it destroys the malignant disease, particularly any part of the nose in which the underlying cartilage may become chronically inflamed.

Postradiation changes may be such as to make it difficult at any time to tell the extent of the original lesion and the amount of adjacent tissue invasion.

The crying need is the opportunity to carry out an early surgical procedure before malignancy has extended to more vulnerable structures.

Dr. Beck cited two cases, one a nasal epithelioma following roentgen-ray treatment, which was handled by radical surgery and one, a prickle cell carcinoma which had apparently been much improved by roentgen-ray treatments.

Dr. Barlow (closing), called attention to the surgical removal of rhinophyma and the rapid healing following it.

The Diagnosis and Treatment of Atopic Coryza (Perennial Hay Fever). Presented by Dr. W. C. Spain, New York.

Following a general classification of coryza, the author discusses as causative factors dusts, sachets, animal substances, foods and drugs, with the relative importance of substances inhaled and substances ingested. The subject of diagnosis is treated, attention being directed to the influence of heredity as found in recent studies of Cooke, Vanderveer and the writer, based on 1,900 cases of hypersensitiveness. A discussion of the interpretation of cutaneous tests is given and asthma and bronchitis as complications are mentioned. The fact is emphasized that chronic sinusitis has been found frequently in this type of coryza and bears a most important relation to the hypersensitiveness of the individual. Specific treatment by immunization and nonspecific treatment, are touched on. The author stresses the relationship which has been found between the hypersensitive state in many persons and chronic sinus infection, and considers an associated hypersensitive condition a very possible etiologic factor in certain cases of chronic sinus infection.

DISCUSSION

Dr. Haskin stressed the need of attention to the general metabolic system in eliminating foci responsible for coryza and cited a personal case in point.

Dr. Lawrence B. Alexander, New York, believed that some nasal pathology underlies this type of vasomotor rhinitis, primarily infectious in origin and usually situated in the ethmoidal and sphenoidal sinuses. People most affected and most susceptible are those of a sensitive, neurotic type who live on a high social plane and are overfed, overclothed and overperfumed. Such people much prefer desensitization treatment to surgery, but the benefits of the latter are clearly seen in clinic patients.

Dr. E. B. Hubbard, New York, spoke of the infectious character of atopic coryza, the intermittant nature of the symptoms, and the normal appearance of the nose between attacks.

Dr. Harold Tobey, Boston, commented on the frequent lack of any skin reactions, on the lessened tendency to consider these patients as neurotic, and on the fact that infection is not the basis of symptoms in many instances.

Dr. Spain (closing) emphasized the hereditary tendency in these cases and the value of a careful family history.

May 25, Morning Session

Vasomotor Disturbances of the Nasal Mucous Membrane. Presented by Dr. Harold G. Tobey, Boston.

The author first describes his work with an anaphylaxis clinic, to which are referred patients with symptoms such as sneezing, rhinorrhea, nasal obstruction, etc. Nasal examination of these patients may show edema or pallor of the mucosa or both, but vasomotor rhinitis may exist with a definitely red mucosa. The pallor in those patients is most apt to be anaphylatic or endocrine in origin.

The cases may be divided into three classes, as follows:

1. Simple turgescence.

2. Turgescence with increased secretion.

3. Turgescence with increased secretion and sneezing.

These are all marked by a redness of the membrane and include all cases of reflex origin.

4. Turgescence plus pallor. Edema may or may not be superimposed. True hay fever belongs in this class, which may show nothing abnormal between attacks.

There follows a careful and comprehensive description of the anatomy of the nasal nerves, their sensory and sympathetic relationships, and their connections with the phenopalatine ganglion. On this as a basis it is shown that rhinorrhea may be the result of stimulation of a reflex arc from the fifth nerve, or from cutaneous nerves through the ganglion and that a similar mechanism for sneezing exists.

The author next discusses direct irritations of the nose which may be intranasal or extranasal. Reflex irritations may arise, via the fifth nerve, from small spots in the nose or from the sinuses, or may originate in other parts of the body.

Endocrine and metabolic disturbances frequently give rise to vasomotor symptoms, with the pituitary, thyroid or ovary as a source. Finally, anaphy-

laxis is shown to be the result of the assimilation of some foreign protein either by inhalation, ingestion, or autolysis of bacterially formed proteins.

The use and value of nasal cultures and vaccines is complicated by secondary infection caused by other bacteria. Diagnosis depends on frequent nasal examinations both between and during an attack, on a careful history and on an investigation of any pathologic condition in the nose or its secretions.

DISCUSSION

Dr. Haskin mentioned a patient with asthma who was entirely relieved by tooth extraction in spite of negative findings by several dentists. Such cases frequently present a mucous membrane ridge along the nasal floor, below which is a diseased tooth root even if not shown by the roentgen ray.

Absorption of toxins, particularly intestinal, is another important element in these cases, and proper alkalinization and cleansing of the bowel will produce remarkable results. Endocrine therapy also helps certain types of patients to a great degree.

Dr. Stucky, Lexington, Ky., urged a dietary treatment embodying wholesome foods such as milk, fruit and cereals, supplemented by alkaline nasal irrigation of the nose.

Dr. Brown called attention to a type of vasomotor rhinitis occurring in many rubber workers who handle anilin dyes.

Dr. Beck explained the microscopic pathology of this condition as being a degenerative process involving the bone. Dietary improvements, especially with regard to fat, result in marked changes in many cases. Cod liver oil and ultraviolet ray (quartz lamp) form a most efficient type of treatment.

Dr. Mosher, Boston, spoke of the division of these cases into two classes, one of which is essentially not anaphylactic and in which such tests are of little value.

Dr. Tobey (closing), seconded the use of some form of ultraviolet light, preferably water cooled, and mentioned his good results in the use of cod liver oil.

The Atmospheric Factor in the Causation of Colds. Presented by Dr. Walter A. Wells, Washington, D. C.

The atmosphere as a universal, inescapable environment has always had, and still has, profound influence on all life.

For the utilization of this element in the life processes, the respiratory organs were developed. In the warm blooded animals there is a differentiation of function in these organs, in that the distal extremity (air cells) are concerned only with the chemical, the proximal (nasal erectile tissue) with the physical properties of the air.

An organ becomes sensitive to the elements or forces to which it is adapted, and, in consequence, is affected by alterations therein. The respiratory tract must therefore be affected by alterations in the atmospheric environment, and the nasal end of it especially affected by alterations in its physical properties.

That the nose, the most frequent site of colds should be especially affected by changes of temperature and moisture, coincides with the generally accepted view that these are the kinds of changes in the atmosphere which especially produce colds.

The nose is concerned with these physical properties not only as an organ of respiration, but as an organ of heat-regulation in conjunction with the

skin. On account of the latter function it is brought into close relationship through sympathetic connection with the skin, and this explains how it is readily affected by atmospheric impressions on the body surface.

Under ordinary circumstances, the nasal organs can adjust themselves to the variations in the physical properties of the atmosphere and perform their respiratory functions as a heat-regulating organ, but it must be adversely affected and suffer in the event of unusual and unnatural states, as extremes of heat and moisture, and especially in an unnatural relationship between temperature and humidity.

Prolonged low temperature, for example, is harmful because it gives no opportunity for wholesome reaction; excessive cold, because it paralyzes the mechanism of reaction; low temperature with very high humidity because the determination of blood is not then altogether consistent with physiologic function; drafts, because unnatural conditions then exist, which hamper the skin and the nasal organs in the performance of their functions and disturb the harmonious relation which should exist between them.

Treatment of Colds, Including the Abortive Treatment and Use of Vaccines. Presented by Dr. Frederick N. Sperry, New Haven, Conn.

In his consideration of the vaccine treatment of the common cold, the author concludes that it is of real value only if a definite focus of infection can be demonstrated. He discusses the types and dosage of various vaccines and describes d'Herelle's work with bacteriophage.

The most efficient method of abortion of a cold is by restoration of the normal nasal circulation, by diaphoresis, and by rest. The chlorin treatment is described with details as to its administration. The most efficacious medications are spirit of nitrous ether, camphorated tincture of opium, belladonna, hydriodic acid, acetyl salicylic acid, iodids and calcidin. Locally nasal drops containing menthol and camphor are useful with children, while adults are best treated by the use of epinephrin, cocain, argyrol or neosylvol, and saline irrigations. Nasal tampons of ichthyol and glycerin have some value.

The author concludes with a discussion of physiotherapy and electrotherapy, massage, and general hygienic and precautionary measures.

Bacteriology of the Common Cold. Presented by Dr. George B. Wood, Philadelphia.

The actual causative agent of the common cold may still be undiscovered, and the usual bacteria found may all be secondary invaders. The starting point of a cold is often in the throat rather than the nose, and the latter may be simply the site of reaction, particularly as the nasal fossae are sterile in 90 per cent. of the cases. The bactericidal power of the nose is evidenced by the fact that certain bacteria placed in the nose are all killed within twenty-four hours. Some bacteria are present at one time, others at another, while the person's own flora rarely appear to occasion a cold. The author discusses the question of a filtrable virus as a cause and cites the evidence for and against it. It is largely in a really purulent secretion that the pyogenic bacteria appear. These are summarized as follows:

1. Pneumococcus, Type 4, very common in a cold, usually as a secondary invader.

2. Influenza bacillus, found occasionally with other organisms as a secondary invader.

3. Streptococcus, may or may not cause symptoms, or may add to severity of infection secondarily.

4. Staphylococcus, a secondary invader.

5. Friedlander's bacillus, of little importance.

6. *Micrococcus catarrhalis*, present normally, aggravating slight colds.

Diphtheroids and a few others complete the list of common organisms associated with head colds but none of them are specific.

THE PREDISPOSING CAUSES OF COLDS. Presented by DR. JAMES G. DWYER, New York.

Although the actual cause of the common cold is unknown, certain predisposing causes are obvious and may be classified as primary, or local, and secondary, or general. The primary predisposing factors may be further subdivided into physical, chemical and bacterial, examples of the first being nasal stasis, anatomic abnormalities, and unhealthy conditions of the air due to gas or to chemicals. Chemical causes may be local, or general, in the latter instance resulting from ingestion of drugs or the formation of bacterial toxins in the intestines. A special study of the acidity of the intestinal tract and the number of colon bacilli present has led to a treatment by alkalinization and ingestion of colon bacilli. More recently, a substance known as histamin has been found to be a toxic intestinal product formed from formic acid, and best combatted by a reduction of sugars and also of the specific bacteria concerned with the formation of histamin. Oxalic acid is also a toxic product which may give rise to colds. Colds may also be associated with endocrine disorders and are frequently the result of reflex changes such as chilling and overheating. The bacterial factors are the subject of another paper.

PREVENTION OF COLDS. Presented by DR. BEAMAN DOUGLASS, New York.

The author at first quotes from letters from a naval surgeon and an admiral, who describe the freedom from colds of sailors so long as they are away from cities and unhealthy air. Figures are quoted from various sources to show the great economic loss arising from colds among people in general. The importance of nasal hygiene as stressed by Culbert is touched on, as well as the value of bathing from a nasal standpoint, also the danger of intranasal pathology and the need of a properly moistened and heated air. Figures are presented to show the advantages accruing from out-of-door occupations and the value of an active circulation.

A diminished blood alkalinity may be a factor in cold production requiring the use of bicarbonate of soda and saline purges. Instances are cited in which colds were unknown among people who had hardened themselves by exposure to severe weather conditions. The question of proper clothing indoors and outdoors is discussed, as well as the importance of adequate physical exercise. The author concludes with the opinion that vaccines as a general rule are useless.

DISCUSSION

DR. SPERRY (closing) showed that the ability of the nose to accommodate itself to a cold has a great bearing on the prognosis, and that local treatment of hypertrophic structures will greatly raise nasal resistance.

DR. CHARLES RICHARDSON, Washington, and DR. HASKIN both emphasized the rôle played by over dry air in the causation of colds.

Dr. H. E. Miller, St. Louis, questioned the accuracy of life insurance and school statistics as to the disability resulting from colds.

Dr. Hubbard called attention to the surprising fact that about half of the New York police force, who live an apparently correctly hygienic life, suffer from colds the year round.

Dr. Wolff Freudenthal, New York, pointed out that so-called colds are not always such, but may be simply irritations from various sources dependent on living conditions. Thus, the dried secretions in the pharynx may cause an irritative cough entirely relieved by their removal. The importance of a proper degree of humidity at home cannot be overestimated, though too little attention is still paid to it. The part played by the skin in "catching" a cold is a considerable one, and efforts must be made to prevent overheating and sudden exposure.

Dr. R. A. Fenton, Portland, Ore., suggested the possibility of unusual bacteria, masked by common ones, being the real causative agent in colds.

Dr. C. M. Sauter, New York, outlined his treatment of cocain, atropin, and argyrol, which he has found highly efficacious in curing and aborting colds.

Dr. Dwyer (closing) discussed the pros and cons of vaccine therapy.

Dr. Haskins mentioned the Gorgas treatment in Panama, where the men were kept free from colds by individual isolation.

Dr. Wood (closing) stressed the fact that colds are a matter of bacteria plus exposure and both factors are essential for their production. Contagion is the biggest factor.

Dr. Wells (closing) laid the responsibility for colds on modern methods of living, particularly with regard to clothing, food and exercise. Prevention, not cure, is the great desideratum.

Observations on Total Laryngectomy for Cancer of the Larynx Done in One Stage. Dr. J. E. MacKenty, New York.

The author recounts the initial efforts of Glück to place a one stage operation for cancer of the larynx on a satisfactory basis and the opposition encountered from advocates of multiple operations. His own work has persistently been along one stage lines with increasingly satisfactory results, particularly as regards a permanent tracheo-skin fistula without the use of a cannula.

In the presence of urgent laryngeal obstruction a preliminary tracheotomy must be performed, but can be so placed as to be included in the later laryngeal removal. The author stresses the importance of preoperative care, with metabolic studies, digitalization if needed, dietary regimen and mouth hygiene. He uses a combined general and local anesthesia. All blood is excluded from the trachea during and after operation, strict attention to drainage prevents neck infection, and naso-esophageal feeding allows an immediate liberal diet. Personal attention must be given every dressing in order to prevent wound infection.

The trachea itself is guarded by the insertion of a cone-shaped rubber cork, to which is attached the cannula, wound with gauze treated with petrolatum thus preventing any wound drainage from entering the trachea. Only cases of intrinsic cancer are accepted, and all bad risks are rejected.

The operation is begun under regional local anesthesia up to the point of skeletonization of the trachea, when general anesthesia is used with the tracheal extension tube in place.

Four special fenestrated gauze-wound double rubber drainage tubes are inserted into the vulnerable points in the wound and kept free by irrigation. The author closes with a description of a fairly satisfactory artificial larynx, which has served to remove one of the greatest drawbacks to this radical procedure.

DISCUSSION

Dr. Chevalier Jackson discussed the probable mechanism of voice production in these patients, and expressed himself in favor of a one-stage operation with intratracheal anesthesia. He differed radically with the author as to the indications for and applicability of laryngectomy so far as intrinsic cases are concerned, but agreed that it should be done only by men with every available facility and frequent opportunities for operating.

Dr. Fielding Lewis, Philadelphia, after calling attention to the good spirits of most of these patients, particularly if they have a usable voice, then described his operative technic whereby a mucous membrane flap or tongue is dissected off the posterior surface of the larynx to be used later in a plastic closure of the wound.

Dr. Beck reported excellent results with the MacKenty operation, as well as from the use of the artificial larynx.

Dr. Canfield strongly favored local anesthesia and the leaving of the wound widely open.

Dr. R. C. Lynch, New Orleans, recounted his results in 100 cases, with the death of one patient from pulmonary embolus. He uses ether anesthesia, keeps the wound wide open and feeds by gastrostomy. Good results have come from the use of an artificial larynx, which increases the feasibility of laryngectomy in extensive intrinsic cases.

Dr. Lee Hurd, New York, laid stress on the fact that laryngectomy is by no means a fatal operation, that the voice is often surprisingly good, and that feeding is most comfortable for the patient when carried on through the wound.

Dr. MacKenty (closing) agreed with Dr. Jackson that incipient intrinsic cases do not require laryngectomy. He expressed his preference for inserting the feeding tube through the nose rather than through the wound, also for general rather than local anesthesia, and stressed the importance of postoperative care.

Lyman Richards, M.D., *Secretary.*

Book Review

ALLERGY, ASTHMA, HAY FEVER, URTICARIA AND ALLIED MANIFESTATIONS OF REACTION. By WILLIAM W. DUKE, PH.B., M.D. St. Louis, C. V. Mosby Company, 1925.

This is a 339 page book, including a complete bibliography and an excellent index. The work represents the most complete treatise on this rather new and more or less elusive but highly important topic. The text is excellent in manner and the separation into short chapters with italicized headings for paragraphs renders the presentation lucid and easy to follow. It is a book that should be read by everyone who undertakes to be responsible for practicing in the field of otolaryngology, particularly because of the severe nasal symptoms resulting from allergy in such conditions as hay fever and the relation so frequently observed of pathology in the nasal passages, especially the presence of nasal polypi in chronic asthma. It seems to us that the presence of anatomic variations, such as irregularities of the nasal septum, have been taken too seriously as etiologic factors.

The otolaryngologist will be edified by getting the point of view of the internist regarding these nasal conditions, for example, the view is put forward that the development of hyperplastic ethmoiditis with polyp formation is the result of the nasal symptoms of allergy, a systemic condition. The relation between the presence of nasal polypi and asthma is one that has interested rhinologists for many years. It is not clear to us from the point of view expressed by Duke why, if the bronchial symptoms and the nasal symptoms are both the phenomena of allergy, we so frequently find a very marked amelioration in the bronchial asthmatic symptoms by the removal of the nasal polypi, and why cocainization of the nose can frequently put an end immediately to the asthmatic attack.

The otologist will be interested in the citation of cases in which the Ménière symptom complex is attributed to the reactions of allergy. This symptom complex, when not occasioned by traumatism affecting the labyrinth or by such conditions as arise from extension of inflammatory disease from the middle ear or intracranial pathology, has been found a not uncommon symptom of chronic progressive (labyrinth) deafness, and it is quite common in these cases to fail to detect palpable alterations in the vestibular mechanism by such tests as we have so far evolved for the study of this part of the labyrinth. The attacks in this form of labyrinth disease are notably irregular in occurrence; often there is but a single attack; at other times they follow in series, sometimes lasting over a period of months or years with uncertain periods of quiescence between. In the cases cited by Duke, there seems to have been tangible evidences of a permanent disturbance of hearing which we are accustomed to find. Allergy does not explain the defect in hearing. Patients frequently complain of vertigo, which on closer study does not prove to have the typical reactions of aural vertigo.*

* Cases of aural vertigo observed during an active attack will show spontaneous nystagmus.